THE IRON AGE — August 3, 1933

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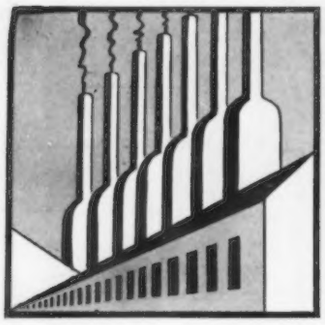

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Forgings

Carbon and alloy; hammered and hydraulically pressed; drop and upsetter; seamless vessels for oil refineries; high-pressure seamless boiler drums and chemical vessels.

Castings

Carbon and alloy steel (open hearth and electric), manganese steel, iron, brass and bronze, rough as cast or machined; abrasion-resisting castings. Centrifugal cast bronze sleeves and liners; ingot moulds.

Wheels and Axles

Wrought steel wheels and axles for freight and passenger cars and engine, tender, and trailer trucks; for electric cars; for mine locomotives and mine cars; for cinder, ore and other industrial cars; crane wheels.

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for Steam, Electric, Mine and Industrial Railways

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Boiler Tubes

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Steel Sheets

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Bethlehem special high speed steel; carbon and alloy tool steels; cobalt magnet steel; hot-work tool steels; die steels; valve steels; rivet set and pneumatic chisel steels; special tool steels; tool steel billets, of all grades. Rock and mine drill steels, hollow and solid.

Corrosion-Resisting Steels

BETHADUR and BETHALON, covering practically every requirement for corrosion-resisting steels.

Tools

Rivet sets, punches and dies; chisel blanks and chisels; hot and cold friction saws; steel stamps (letters and figures for hot and cold work); slitting shears, shear blades; special high speed tool holder bits; special tools.

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Bethlehem wide-flange beams, girders, and H-columns; joists and stanchions; standard beams, channels and angles; car and shipbuilding shapes; standard and special T- and Z-bars.

Steel Plates

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Flanged Products

Tank heads, boiler heads, dome sheets, manheads, yokes, bolts and saddles; miscellaneous flanged plate work.

Concrete Reinforcing Bars

Bethlehem deformed bars of constant section, in standard rounds and squares.

Steel Sheet Piling

Bethlehem (Lackawanna) steel sheet piling for bulkheads, jetties, cofferdams, and similar applications.

BETHLEHEM STEEL

BETHLEHEM STEEL

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A Golden Eagle for Bankers

SUCCESS of the Recovery Act, says President Roosevelt, will depend very largely on the cooperation of the vast number of our smaller employers.

A large number of these men and women, who would gladly sign the emergency code agreement to immediately raise wages and curtail working hours, are faced with a very practical problem.

They agree with the President that raising prices of their products even in strict proportion to the increase in cost will defeat the purposes of the Act, for it will prevent the desired increase in purchasing power.

They believe that eventually, if prices are kept down and wages put up, the increased volumes of business will restore their profit margins.

But meanwhile, say for the next 90 days, they do not know where to find the money to finance this hiatus.

They wonder how much weight the blue eagle will have, if any, with their bankers in extending loans for financing increased payrolls.

The banker, as the accepted custodian of credit, has a larger part to play in connection with this movement than merely to pay minimum wages and adhere to maximum work week hours.

He cannot say, "I have done my part," unless he recognizes his broader responsibility by regarding the blue eagle badge of his client as an important factor in credit consideration.

We suggest that the Recovery Administration issue a golden eagle emblem for display by those bankers who acknowledge and live up to this responsibility.

Please turn to the article on page 46 of this issue by Prof. J. L. Snider on the subject of utilizing unused bank reserves.

Machining C

on White "Pan ca

BORING the cylinder block and connecting rod clearance holes in the crankcase. These holes are bored and the valve lifter guide holes are rough and semi-finish bored in one operation.

ONE of the interesting recent developments in the automotive field is the bringing out by the White Motor Co., Cleveland, of a new type of bus motor. In design the engine is a radical departure from any motor heretofore built for vehicular service and is being used by the company to power its 44-passenger "City Coaches."

The engine is a 12-cylinder horizontally opposed type unit with two separate cylinder blocks, one on either side of the crankcase. It is built in a flat shape in order that it may be placed entirely beneath the floor of the coach. Because of its unusual shape the unit has been designated as a "pancake" type engine. The design provides uninterrupted floor space except for the wheel housings, thereby securing maximum passenger capacity.

The motor contrasts with other types of automotive engines in that the bore is larger than the stroke (the former being 4½ in. and the latter 4¼ in.), the oil pan reservoir is located above instead of beneath the crankcase, and accessories including the fan, water pump, air compressor and hydraulic steering pump are separate from and at the front of the motor.

The engine is 74½ in. long, 57 in. wide and only 16 in. deep. The crankcase, of aluminum alloy, is necessarily large in dimensions and rather intricate in design. The crankcase casting weighs 258 lb., which is reduced to 208 lb. after machining. Each cylinder block of nickel-chrome cast iron weighs 305 lb. in the rough casting and 232 lb. after finishing. The total weight of the completed unit is 2036 lb.

A production line was laid out for the manufacture of this motor, and was equipped with the most modern type of machine tools for precision, high-speed and economical work. It included machines of special design and also various special fixtures for handling the work. However, with limited production as compared with most passenger automobile plants, the machine tool equipment does not include multiple-spindle drilling machinery and special high production tools, as this class of equipment is not required.

Machining the Crankcase

Crankcase castings are placed on a roller conveyor at the receiving entrance to the machine shop. In this conveyor line is a spray booth in which the inside of the casting is sprayed with red engine enamel. This coating seals all surfaces that are not machined. Various milling operations on the crankcases, oil pans, cylinder blocks and cylinder heads are performed on a battery of four fixed rail-type milling machines arranged in line in one of the bays, two being used for crankcases and two for cylinder blocks. These machines were built by the Ingersoll Milling Machine Co. One to three operations are performed on each machine. On some work rough and finish milling is done in one set-up, but some parts have more points to be machined than is possible with a single set-up.

The first operation on the crankcase is rough milling of the oil pan face and bearing cap dowels, a certain amount of stock being left for the finish cut. The oil tank face is milled with a pair of 14-in. cutters and the dowel face with a cutter the width of the dowel. Because of the size and design of the crankcase the rough cuts as far as possible are taken before any finish operation. This is done to avoid the danger of warpage that might occur should finishing cuts be taken before all the rough cuts are made.

The work is located in the fixture from points established and cast for that purpose on the casting. After the faces are milled inside points of location are established in relation to outside points. From these inside points a jig is located and two dowel holes are provided, one at each end of the crankcase. These are used as location points for every succeeding operation. These dowel holes are drilled, after the milling operation, on a 24-in. drilling machine provided with a special table on which the fixture moves both lengthwise and crosswise.

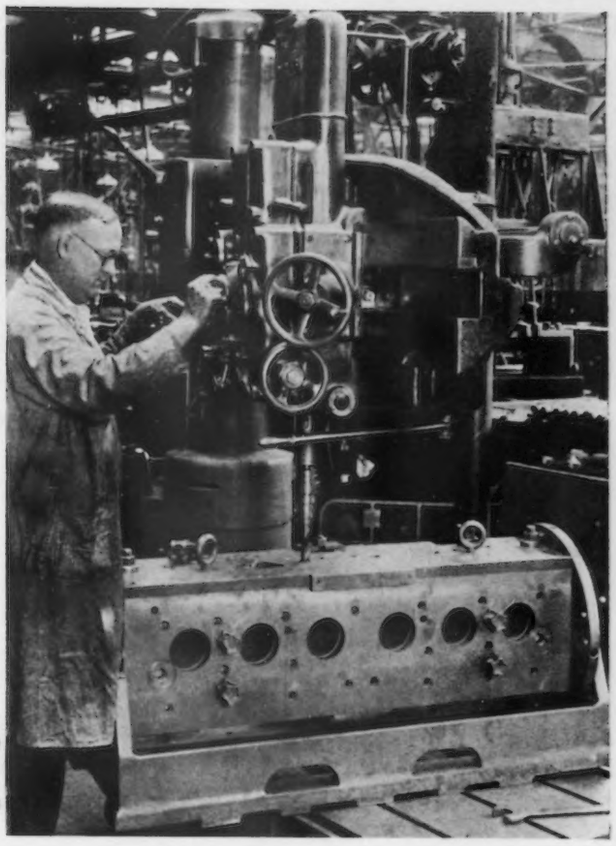
The cylinder contact faces are then rough milled on a No. 4 vertical milling machine with a 10-in. cutter. The casting is then returned to the Ingersoll machine for finish milling of the oil pan face and the bearing cap dowels.

Rough milling of the gear and clutch end of the case follows. This

ng Operations

an cake" Type Engine

By F. L. PRENTISS



DRILLING sides, top and bottom of the cylinder block on a single-spindle machine. One fixture is used for all holes and all holes except those in the ends are drilled in one setting

is done on a Hydromatic milling machine with a 16-in. cutter. Two fixtures are provided, these being so constructed that they will hold a casting in position for milling either end. While one end of a case is being machined the operator reverses the position of the case on the other fixture or puts on a new piece.

Finish milling of the cylinder contact faces is the next operation. This is done on a No. 4 vertical milling machine. The fixture is the same as used for the roughing operation except that it has two different locating points.

The gear end is then finish milled on the Hydromatic machine on which the rough cuts were taken, the finish of the clutch end being left for a later operation. Then the necessary bosses are milled.

Universal Machine for Boring Crankcases and Cylinder Blocks

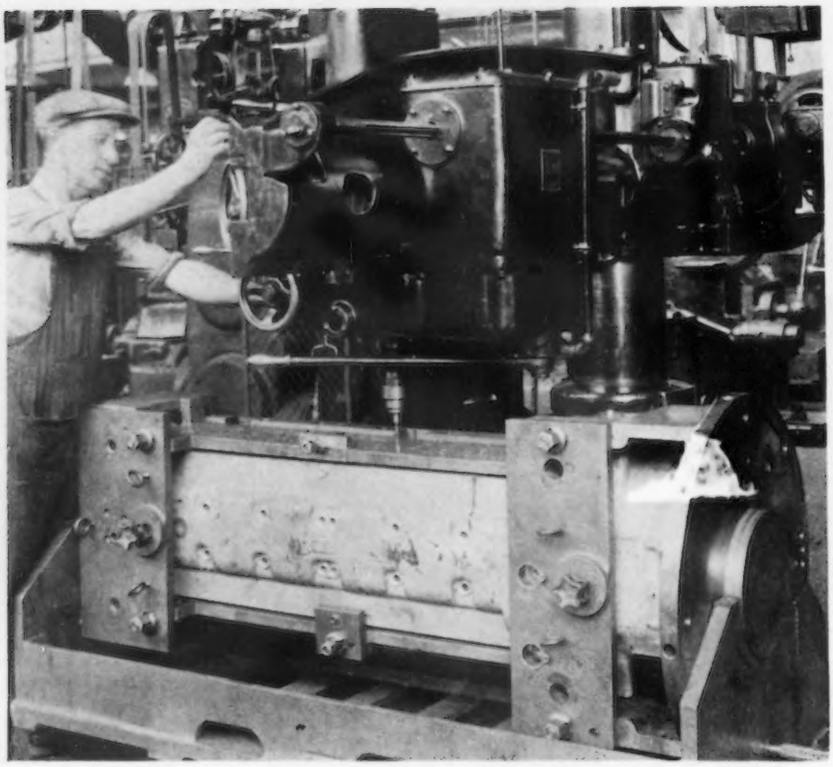
The next machine in the production line is a motor-driven Ingersoll vertical boring machine with hydraulic feed. This has a special cutter spindle with Timken bearings at the head and four smaller spindles at the back and front. This, a universal machine, will take any spacing between cylinder barrels and is used in boring both crankcases and cylinder blocks. Two operations are performed with this machine on the crankcase. The connecting rod clearance holes are bored and the valve lifter guide holes are rough and semi-finish bored in one operation. Sizing of guide holes is done in a second operation. One fixture is used for both operations. Main bearings are milled to length in the next operation on a No. 4 vertical milling machine.

The next operation is drilling all the holes in the top, bottom and sides of the crankcase, 180 in number, and also counterboring and tapping some of these holes. A cradle-type jig is used for drilling all these holes and the drilling is done with a single-spindle radial drill. These drilling operations include drilling bearing cap holes 8 in. long which must be in perfect alinement. Bearing caps are assembled to the case after drilling.

The next machine is a horizontal boring machine on which the crankshaft and camshaft holes are rough and semi-finish bored at high speed, gear clearance is bored in the front end, and the front cam bearing bosses are faced and chamfered. The fixture for these operations, made by the Ingersoll Milling Machine Co., has holes to admit the boring bars and at the side of these circular holes there is a recess to provide clearance space for the tool bits. The fixture is mounted on a swivel base. After the loaded fixture is brought into position a hydraulically-operated head is moved forward to the boring bar and the bar is connected by a quick-operating device. Then the machine is started. Three boring bars are used, two for the camshaft and one for the main bearing. There are seven tool bits in each bar. Each boring bar is provided with wearing strips of Stellite that are welded around the circumference of the bar to prevent wear at the points of contact with the surface of the holes in the fixture. The same machine and fixture are used for semi-finish boring operations on the cam and main bearing bores and for the finish boring of the main bearing bore. Close limits, 0.0002 to 0.0004 in., are adhered to in fitting the bearing caps to the case.

Diamond Boring Operations

After the series of boring operations, cylinder blocks are assembled to the crankcase and mounted on a diamond boring machine which finish bores the camshaft main bearing holes. This finish boring is done after assembly to eliminate any deflection or elongation that might develop in



ALL holes in the top, sides and bottom of the crankcase, 180 in number, are drilled on this radial drill. The piece is mounted in a cradle-type fixture.

the cam holes if finish bored before assembling. The diamond boring machine used for this operation was designed by the White Motor Co. and built by the Ingersoll Milling Machine Co. It has two boring bars fitted with cemented tungsten-carbide tools and one bar fitted with diamond tools for main bearings. Before the disassembly of the cylinders after diamond boring the blocks are stamped so that they will be used with the same crankcase when the motor is finally assembled.

The next operation is assembling studs in the oil pan contact face and assembling the oil pan. The clutch end is bored, faced and chamfered, then all necessary holes are drilled in both the gear and clutch end. Next the oil tank is disassembled from the crankcase and the main center bearing is finish faced to width. The crank bearing caps are then disassembled and the oil holes from the bottom of the crank bores to the oil lines are drilled, redrilled and dowel holes are reamed. After a water test the cam bushings and main bearings are assembled. Finally the main center bearing is faced to width and other necessary holes are drilled and studs are inserted.

Cylinder Block Machining

The cylinder blocks are delivered to the two Ingersoll fixed-rail milling machines for the first machine operations from the same roller conveyor that handles the crankcases. These machines differ from those used for the crankcases in that their beds are narrower and they are not equipped for as high speeds as the machines used for milling the aluminum crankcases. These machines have 7, 9 and 11½ in. cutters, four in front for roughing and semi-finishing, two for crankcase contact faces and oil pans, and two for cylinder blocks and heads, and the other three in the rear for the finishing cuts. Before the blocks are milled the inlet valve passages and the spring chambers are sprayed with red enamel.

The first operation is rough milling the crankcase contact face, valve cover and manifold faces and milling clearance between the intake manifold chamber all in one operation. Points for locating the piece in the fixture are provided when the casting is molded. After the first milling operation, two holes are drilled in the cylinder block face and these are used as dowel holes for location of the block for further machine operations. Because of the comparatively small production of a motor of this type all drilling is done on single-spindle radial drills, thus avoiding the expense of multiple-spindle machines in the production line. All holes in the cylinder block except in the ends are drilled in one setting, one fixture being used for all the holes, thus avoiding the time and labor of changing fixtures. However, later a few drilling operations are done in simple fixtures.

Cylinder Boring

After the principal holes are drilled the outside pads are milled. The blocks then go to the same Ingersoll boring machine that is used for machining the crankcase. On this the cylinder valve troughs are rough bored and the valve stem guide holes are spot drilled and counterbored for

ROUGH and semi-finish boring of the crankshaft and camshaft holes and other operations are performed at high speed on a horizontal boring machine with hydraulically-operated head. The crankcase is mounted in a special fixture having a swivel base.

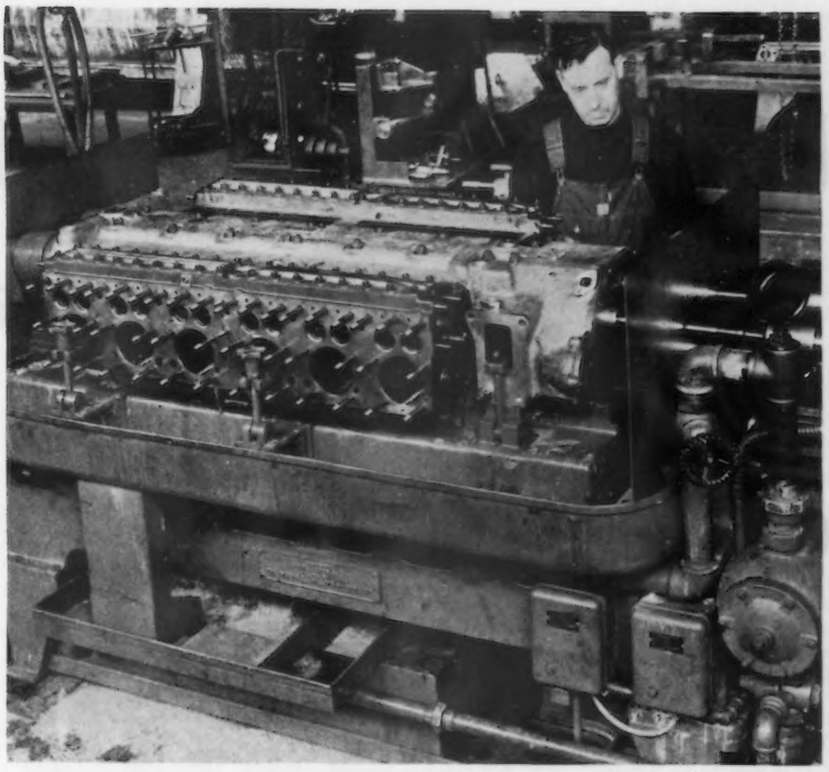
exhaust valve inserts in the form of Stellite rings which provide valve seats that give long service without regrinding. Semi-finish and finish boring operations are also performed on this machine. Three spindles are employed for simultaneous operation.

When operations on one cylinder are completed the block is moved along the bed for operations on the next cylinder and this is continued until the operations are completed on the six cylinders. Between the rough and finish boring operations the crankcase contact face is finish milled on a No. 4 vertical milling machine.

Grinds Double Taper Holes in Gears in One Setting

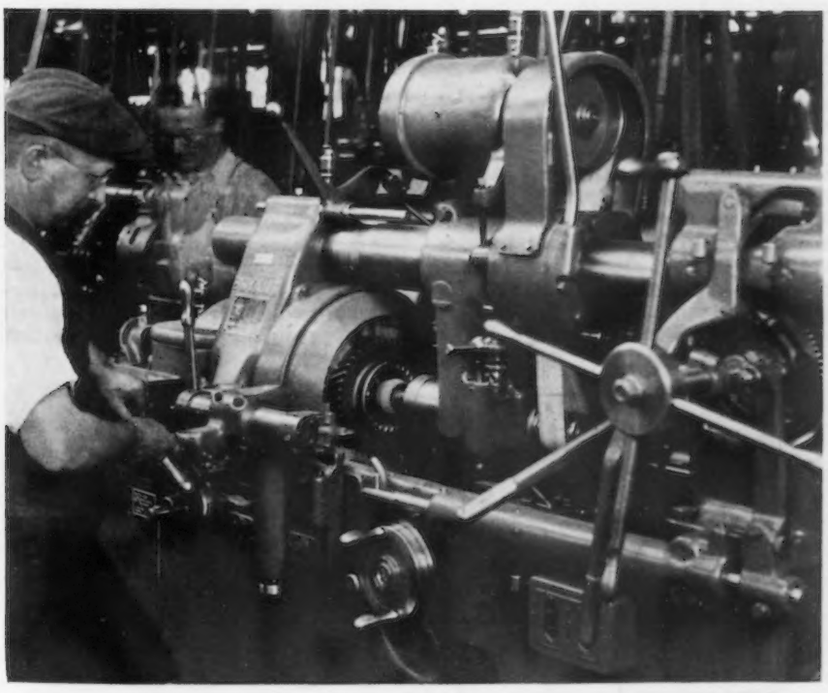
Operations that follow include spot facing spring sets, drilling and reaming distributor shaft holes, counterboring the top cylinder head stud holes and countersinking and tapping stud and bolt holes. Subsequently the cylinder bores are chamfered at both ends.

After this the exhaust valve inserts are assembled with gaskets and screws. Then the block is washed, cleaned on the inside, core wires are removed, if any are left by the foundry, and the intake valve parts are touched up with engine enamel. Then the valve stem guides are pressed in and broached to size, the intake valve seats are chamfered and the exhaust valve seats are ground. Finally all machined surfaces are sprayed with oil to prevent rusting before assembling.



CAMSHAFT main bearing holes in the crankcase are finish bored on a diamond boring machine of a special design and with the cylinder blocks temporarily assembled to the crankcase.

In the manufacture of the transmission a new design of machine is provided for the grinding in one setting of double taper holes in transmission gears and in some of the rear axle gears to receive Timken tapered bearings. Simultaneous grinding of the two tapers assures proper alinement of the two tapers in respect to each other. This grinding is done on a machine built by the Bryant Chucking Grinder Co., Springfield, Vt.



DOUBLE taper holes for tapered roller bearings are ground simultaneously in transmission gears on a grinding machine of a new design.

Chrome-Molybdenum Castings for Oil Industry

A low-chromium casting steel alloyed with 0.50 per cent molybdenum has been added to its list of cast alloy products by the Lebanon Steel Foundry, Lebanon, Pa., to meet the requirements of oil-still parts. High strength and resistance to corrosion, especially to that of hydrogen-sulphide gas at high temperatures, and also a small creep factor are among the special specifications that should be satisfied; and headings, fittings and impellers made of the alloy have undergone the test of service.

Physical Characteristics

The chromium content ranges from 4½ to 6½ per cent and the carbon from 0.15 to 0.35 per cent. The tensile strength is guaranteed at 110,000 lb. per sq. in., with a maximum expected value of 125,000 lb. The corresponding yield points are 75,000 and 90,000 lb.; the elongation is 16 per cent guaranteed and 20 per cent expected; reduction in area, 30 and 55 per cent and the Brinell hardness 215 to 255. At 1000 deg. F. the yield point is 60,000 lb. and the tensile strength, 75,000 lb.

Bars Tested Magnetically for Seams and Internal Defects

COLD-DRAWN steel bars are being magnetically tested for surface and internal defects by the Union Drawn Steel Co., Massillon, Ohio. For several months the company has been conducting experiments on a new testing method with the use of testing apparatus developed for this purpose by the Magnetic Analysis Corpn., Long Island City, N. Y. Seams and other defects that are in excess of 0.005-in. deep are detected magnetically and indicated by the contour of a curve produced by a beam of light.

This is said to be the first commercial application of magnetic testing in a steel plant, although this and other methods of magnetic testing are being used by some makers of finished steel products.

Defects in steel bars which do not penetrate the bar surface more than 0.005-in. usually cause no trouble during subsequent machining operations, and, if such surface defects are objectionable, the cold-finished bar makers are able to supply ground and polished bars free from surface imperfections.

However, with commercial steel bars there are occasionally internal seams and cracks in the bar stock of sufficient importance to cause rejection of the finished part made from such steel. Unfortunately, in many cases these defects are under the surface of the bar or may be of such a nature that they cannot be detected by visual inspection. Should these defects not be discovered until the steel has been converted into a finished part by machine operations, the user suffers the loss that results from the rejection of a part which must be scrapped after machining.

Inspection by magnetic testing is regarded as especially desirable for cold-finished bar stock used in making piston pins, automotive parts which are subject to stress and shock, taps and dies, and other pieces that require considerable machining. The process is also found of advantage in connection with steel used for airplane parts where safety is so essential.

Another use for this method of testing is for the identification of mixed grades of steel or material having objectionable variation in analysis. Should steel of the same classification, made from different heats, become mixed in handling, tests will show the bars that are identical in their elements and permit their proper separation.

The Testing Apparatus in Brief

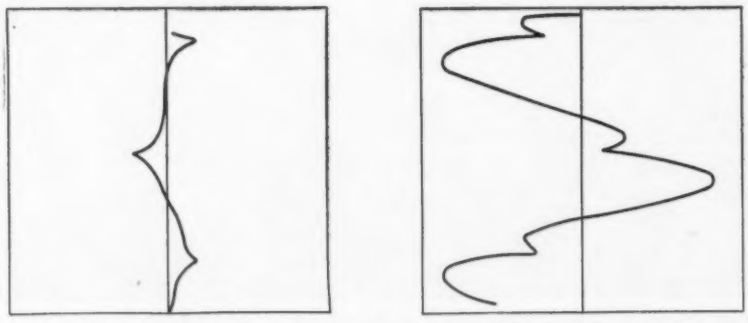
The testing apparatus consists of three main units, two test coils and current regulators, (one test coil being for the specimen and the other for the standard bar), a harmonic analyzer and an oscillograph, the last being the instrument that registers the light curves. The test coils are alike; a primary coil provides the magnetic field for the bar that is being tested and a secondary coil brings the induced current through the harmonic analyzer to the oscillograph.

The primary coils are connected in series and both wound in the same direction. The two secondary coils are opposed in respect to the flow of current, being wound in opposite directions. The primary coils have the same strength magnetic field. As the two secondaries are opposed to each other, current is induced in the specimen secondary that will not balance with that of the standard secondary if the piece being tested is not like the standard test piece and a difference in wave shape results.

The standard test piece is carefully selected and given a thorough laboratory test, being checked and chemically analyzed to make sure that it is perfect. This test bar then becomes the standard test bar for checking the remainder of the lot of steel. The coil in which the specimen bar is placed lies in a tube having water in circulation to keep the bar at uniform temperature, so that changing resistance of the bar will not be a factor. The bar being tested is passed through the second testing coil, which is mounted at a height convenient for handling the pieces.

The harmonic analyzer consists of an induction coil and condensers for tuning to 60 or 180 cycles and produces two types of waves. The one is a 60-cycle wave, with the harmonics filtered out. This is a true sine curve that is best adapted for showing seams and cracks. The other is a composite wave that is better adapted for showing variations in analysis. The composite curve is very irregular in shape, being distorted by the effects of the harmonics. The steel may be given separate tests with both waves if it is desirable.

The oscillograph is an instrument for showing the shape of the wave of the electric current on ground glass. It consists of an optical galvanometer and synchronous motor. There are two galvanometers; one is in the secondary set, and the other, not connected to the current, acts as a zero line, producing a straight, vertical



THE drawings show variations in wave shape and amplitude produced by the oscillograph In 1, the specimen was also Supercut steel; in 2, the specimen was S. A. E. 51

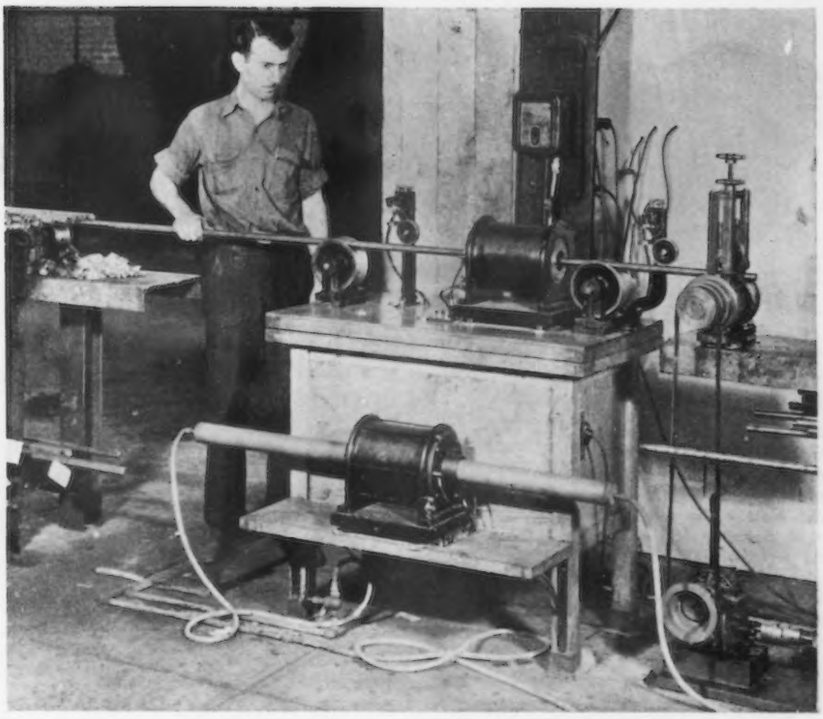
A STEEL company has equipped three of its plants to test all of its cold-drawn bars so that the customer may be assured that rejections will not occur after machining has revealed defects. Mixed grades of steel can also be unscrambled by the apparatus, which employs magnetic analysis. The idea of a 100 per cent test of a lot is regarded as of more than passing importance in the manufacture of taps and dies and automotive parts that commonly require considerable machining work.

line of light on the ground glass. The wave shape of the current is produced by a beam of light which is reflected by the galvanometer upon a vibrating mirror which vibrates 60 times per second. The light from the mirror is reflected on the ground glass, showing the wave shape of the current passing through the galvanometer.

Operation of the Apparatus

The oscillograph is located in a darkened booth adjoining the testing coils and an attendant detects imperfection in the steel by the light curve shown on the ground glass. As long as this curve remains of a certain phase and amplitude, the piece being tested is free from defects but should the light curve start to waver, that fact indicates that the piece being tested has defects.

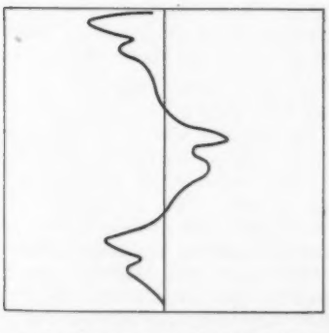
The composite curve shows a change in amplitude when the piece of steel being tested has a marked variation in analysis from the standard test piece, as in carbon, manganese, phosphorus or sulphur. For example, should bars from two heats, one having 32 per cent and the other 38 per cent carbon, become mixed, these can be separated by the testing apparatus, or steels having a variation of 50 points in sulphur may be separated. The oscillograms reproduced herewith show the variations of wave shape and amplitude when Supercut screw steel was compared to its own and other grades of steel.

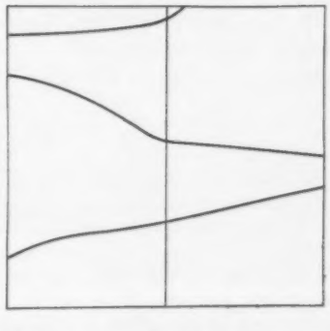


ATTENDANT is passing a bar through the test coil. The standard bar, to which the piece being tested should conform, is located in the coil mounted on the bracket. The oscillograph, which shows by a beam of light on ground glass whether or not the piece being tested compares properly with the standard test piece, is located in a small booth just back of the testing apparatus.

The apparatus is capable of testing bars at the rate of 70 ft. a minute. It may be used for inspecting stock up to 3 in. in diameter or its equivalent in any shape. However, it finds its largest use in testing smaller sizes. About two amperes of current is used in testing most grades of steel.

With the use of this apparatus, it is possible to give all the material a test through the entire length of each bar, and the producer is able to guarantee to the customer, for a slight extra charge, that all the bars are free from defects. The Union Drawn Steel Co. has installed three units of the apparatus, now using it for testing steel in its Massillon, Ohio; Gary, Ind., and Hartford, Conn., plants, and shortly will add two additional units. These are all operated under a leasing arrangement with the Magnetic Analysis Corpn.





In all of these the Supercut steel of the Union Drawn Steel Co. was used as standard. in 3, the steel compared was S. A. E. 1020, and in 4, the specimen was S. A. E. 4615.

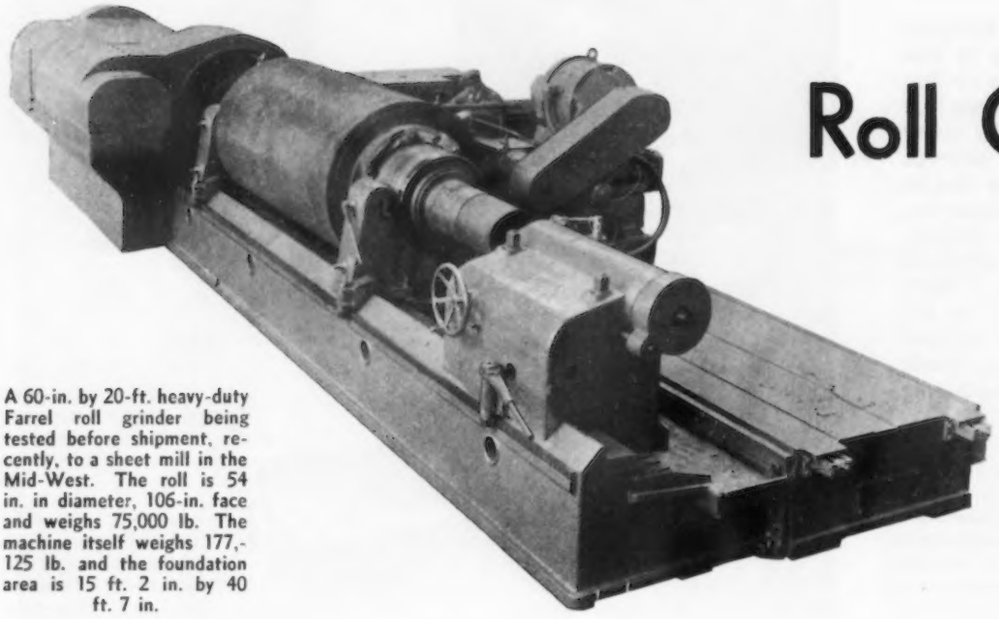
Conversion of Hardness Numbers

THE question of the conversion of the Firth diamond hardness numbers to Brinell hardness numbers has arisen in connection with an article in THE IRON AGE of May 18, on cast iron suitable for nitrogen hardening, by J. E. Hurst, technical director of the Sheepbridge Stokes Centrifugal Castings Co., Ltd., Chesterfield, England. Mr. Hurst makes the following observations in respect to the conversion factors: "In the lower ranges of hardness the Firth numbers are identical with those of the Brinell scale. Below is a table of Brinell and Firth hardness numbers from which you will notice that above Brinell 400 there is a change in relationship.

Brinell Number	Firth Diamond Hardness Number
100	100
200	200
300	300
400	410
500	540
600	690
650	790

"Brinell hardness numbers over 600 are very unreliable due to the flattening of the Brinell ball when testing materials of such high hardness value. There is, therefore, no strict comparison above Brinell 650, and Firth diamond hardness or Vickers diamond hardness numbers only can be used.

Roll Cambering De



A 60-in. by 20-ft. heavy-duty Farrel roll grinder being tested before shipment, recently, to a sheet mill in the Mid-West. The roll is 54 in. in diameter, 106-in. face and weighs 75,000 lb. The machine itself weighs 177,125 lb. and the foundation area is 15 ft. 2 in. by 40 ft. 7 in.

THE rolls used in rolling mills, calendering or like machines are finished with a flat, a convex or a concave surface. The modern machine for producing these surfaces is the roll grinder and, inasmuch as the accuracy of shape depends upon it, the crowning and concaving mechanism is a most important part of that machine. The successful operation of the process for which the rolls are used is so dependent on their shape that more thought should be given to the crowning and concaving device than is generally accorded it.

Considerable change has been made in cambering attachments in the last 10 to 15 years so that today the user of such a device can expect:

(1) That the machine will produce correctly shaped rolls, either convex or concave, for any roll size and with any amount of convexity or concavity within the range of the machine.

(2) That the contour of the roll shall be absolutely symmetrical on either side of the center.

(3) That the attachment can be quickly set for different roll lengths and different amounts of crown or concavity.

(4) That the same setting of the mechanism will always produce the same shape on a roll.

(5) That the amount of crown or concavity will not be affected by roll or wheel diameter.

(6) That means should be provided so that special conditions demanding a slight deviation from theoretical shape can be met.

Forming Bars

Realizing that rolls were crowned to compensate for deflection under load, one of the earliest devices for grinding a crown on rolls was a bar or a slender roll, bent and used as a master form. While this was a decided improvement over shaping a roll by manual control of wheel feed, it failed to meet several of the present day requirements.

When in actual use, rolls are deflected by a uniform load over a part of or over their entire face. In bending a bar or roll it is extremely difficult to obtain this uniform loading. One load, whether applied by weight or by screw, gives an elastic curve, but it is that of a beam with a single concentrated load. Several weights or screws give the master bar a shape of a beam deflected under several concentrated loads. The difference between the deflection curve of a beam or roll bent under a uniform load, a single concentrated load and several concentrated loads is clearly shown in Fig. 1.

▲ ▲ ▲

IN the accompanying article, the author describes the features, the advantages and the limitations of some of the devices which have been used for the purpose of shaping rolls.

As coming from an engineer of high standing and associated with a company that has been building machines for roll grinding since 1869, we feel that Mr. Lewis' studies and findings will be of considerable value to the industry.

▼ ▼ ▼

In addition to the difficulty in obtaining the correct shape, trouble is experienced in grinding a roll absolutely symmetrical about the center. The master bar must be of exactly uniform section, corresponding weights or screws must be spaced exactly the same distance each side of the mid point and exactly the same pressure must be applied at exactly corresponding points. Thus, to set the bar for different roll lengths and for different amounts of crown takes considerable time and, as pointed out above, the mechanism for shaping the roll should be quickly and easily set.

The use of a master bar or former machined to a definite and permanent shape eliminated the difficulties occurring with the sprung bar, as far as symmetry of roll was concerned. However, this permanently shaped former can be correct for only one length of roll. If varying lengths of rolls are ground it is necessary to accept a compromise shape or correct the shape by hand feeding of the wheel. Fig. 2 shows the results obtained by the use of one former for different roll lengths. Curve *A* is the crown shape on a roll long enough to utilize the full surface of the master bar and is the correct curve for a roll deflected under a uniform load. Curve *B* shows the shape obtained on a shorter roll, that is one that could use only the central portion of the former. Note that curve *B* is quite flat and departs considerably from the correct shape as shown by curve *A*.

Both the sprung bar and the permanently shaped bar type of crowning devices are apt to be complicated by the linkage system used to transfer the motion from the bar to the wheel itself. The discussion of the forming bar type of cambering device above is based on the assumption that the linkage is such that the shape obtained on the roll is a directly proportional reproduction of the curve of the bar. The mechanism between the cambering bar and the wheel intro-

g Devices ▲ ▲ ▲

By R. C. LEWIS
Mechanical Engineer, Farrel-Birmingham Co., Inc., Ansonia, Conn.

duced no added complications provided it transmitted motion directly proportionally and was so arranged that backlash and deflection of linkage members did not influence the results.

Effect of Wheel Lift

One of the most commonly used schemes for moving the wheel itself is to lift it vertically, or approximately vertically, by tilting the wheelbase about a pivot behind the wheel (see Fig. 3). When the wheel is moved in this manner the shape produced on the roll is not a reproduction of the shape of the forming bar. As shown in the sketch the shape on the work is a function of the wheel lift and the distance between centers of work and wheel. The master bar can control the wheel lift only. An attempt to adjust the lift to suit wheel and work diameters and length of roll face leads to a most complicated scheme of control quite beyond the average operator fully to understand and to set.

When the wheel base is pivoted in front there is no difficulty with the linkage system itself, provided, of course, that members are strong enough to resist deflection and so arranged that backlash has no influence on the result.

Where the wheel head is moved directly to and from the work, either by rotating the feed screw or by moving the base along its ways, backlash is an important factor.

When the feed screw is rotated the roll is not shaped correctly and generally is not symmetrical due to the lag in wheel movement while backlash is being taken up in the feed screw nut at the center and ends of the roll, that is, at the points where the device stops pushing and starts pulling, or vice versa.

If the wheel base is moved to and from the work on ways the same effects are apparent as the strain on parts changes from a tensile to a compressive strain and as backlash in fits is taken up at the center and ends of the roll.

Fig. 4 illustrates the effect of deflection and backlash. Curve *A* shows the result obtained where one member of the linkage system was too weak and when backlash had to be taken up. Curve *B* is the result obtained with the same device but with deflection and backlash eliminated. Curve *C* is the theoretically correct curve for the roll. The curves *A* and *B* are plotted from actual measurements taken during a test of a crowning device.

Rotating Formers

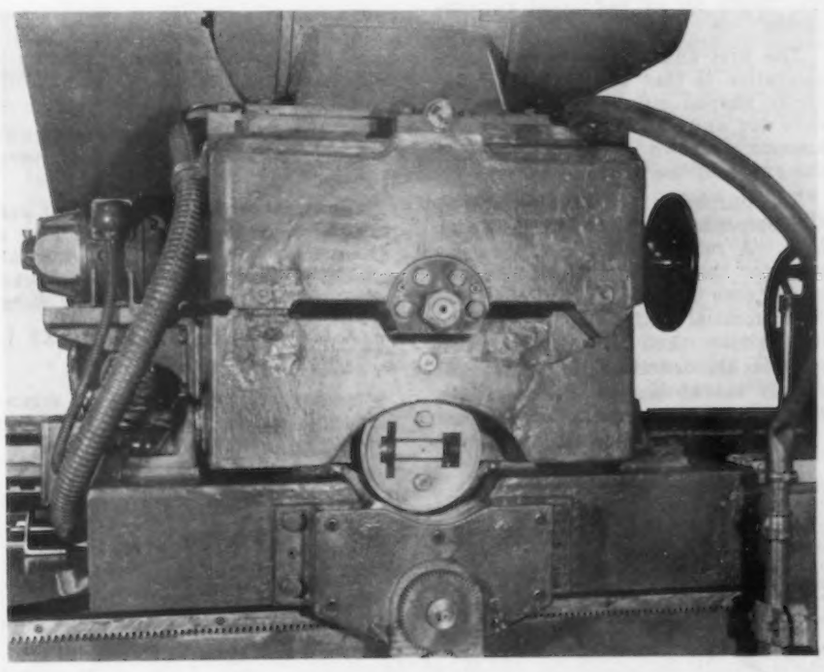
The use of a rotating member in place of the fixed former eliminates some of the difficulties experienced with the cambering bar. By using change gears it is possible to utilize the full surface of the forming member for all lengths of roll and so have the cam correct for all roll lengths.

However, some of the devices utilizing a rotating former do not act directly, that is they work through a linkage system that modifies the results, or the cam operates to lift the wheel vertically.

The effect of lifting the wheel vertically has been explained above in connection with the use of a forming bar. As the troubles are due to the fact that the crown is a function of the angle formed with the horizontal by a line connecting the center of the work and the wheel, and this angle changes, even though the lift may be the same when work and wheel size change, the same difficulties are experienced when a cam is used as are encountered when a master bar is used.

If the linkage system has members weak in section so that their deflection under load is measurable or is so arranged that backlash or friction between parts has a chance to affect the result on the roll, the same troubles will be experienced with a rotating former as were explained above as occurring when a bar is used with such linkage systems.

Also, if the linkage system is arranged so that the action is different on each side of the center of the rotating member, the roll will not be symmetrical. Fig. 5 illustrates a typical linkage with which this occurs. This lack of symmetry can be easily compensated for with a single wheel machine as the error is small and the ordinary operating adjustment of lining up the roll for grinding takes care of the error. However, on a two-



Close-up of Farrel patented crowning and concaving device. The circular cam is set eccentric by loosening two nuts and turning the adjusting screw. The amount of eccentricity determines the amount of crown or concavity, because as the cam rotates eccentrically, it raises or lowers the follower roller, which, in turn, raises or lowers the wheelhead.

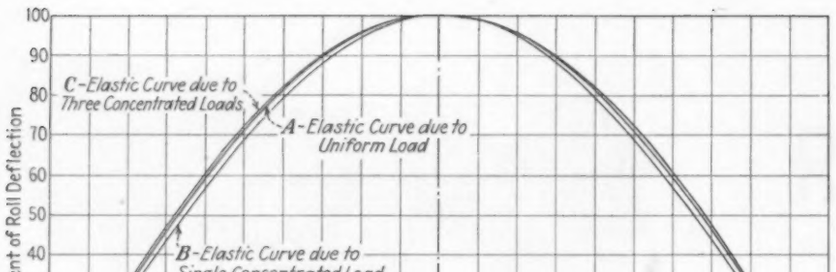

C-Elastic Curve due to Three Concentrated Loads
A-Elastic Curve due to Uniform Load
B-Elastic Curve due to Single Concentrated Load
Per Cent of Roll Deflection
Per Cent of Roll Length

Fig. 1. Beam Deflections Under Various Types of Loads

wheel machine it is almost impossible to eliminate the error, for the action of the wheels opposes each other and to move one end of the roll toward or away from one wheel to compensate for this lack of symmetry increases the error with respect to the other wheel.

A Successful Eccentric Type Cambering Attachment

Early in this article the requirements of a present day cambering device were listed and the explanations which followed up to this point have been devoted to showing how some devices used for cambering rolls fail to meet some of the most important of these requirements. We now come to a discussion of a cambering attachment applied to a modern roll grinding machine which overcomes the objectionable features mentioned and meets all of the listed requirements.

The first and most important consideration is that rolls shall be correctly shaped either convex or concave for any roll size and with any amount of crown or concavity within the range of the machine.

The purpose of crown on a roll is to compensate for deflection under load. A roll is concaved to compensate for the extra expansion of the center over the expansion at the ends. Mathematical analysis and experience have shown that the correct crown shape is the deflection curve of a uniformly loaded beam. Years of use have demonstrated that most satisfactory results are obtained with rolls concaved to a shape commonly designated as that of a straight edge cross. These two curves are different, as is illustrated in Fig. 6. The cambering mechanism must be able to produce either curve. An eccentric, if rotated through the proper angle, will produce both desired curves very closely.

The equation for the movement due to rotation of the eccentric is: $T = e(L - \cos \Theta)$. The equation for the elastic curve (Machinery Handbook) of a uniformly loaded roll is $Y = \frac{W X (L - X)}{24EIL} (L - X (L - X))$.

Assuming the mid position of eccentric and roll as zero, the following tabulation illustrates how closely the movement of the wheel due to the eccentric conforms to that required for the elastic curve. Total rotation of the cam is taken as 85 deg. each side of the center.

Per Cent Rotation and Per Cent Roll Length	*Wheel Movement*	*Required Movement*	*Error*
10	.04787	.04769	.00018
20	.18728	.18688	.00040
30	.40607	.40608	.00001
40	.68510	.68608	.00098
50	1.00000	1.00000	.00000

The figures in this tabulation are read direct for a total movement of 1 in. or, since crown is measured on the diameter, a total crown of 2 in. For crowns within usual requirements the differences shown in the table (in all cases less than .001 in.) become exceedingly small. For 100/1000 in. crown the errors shown would be multipled by .05, so that the maximum error would be —.000049 in. and for smaller crowns the error would be proportionally less.

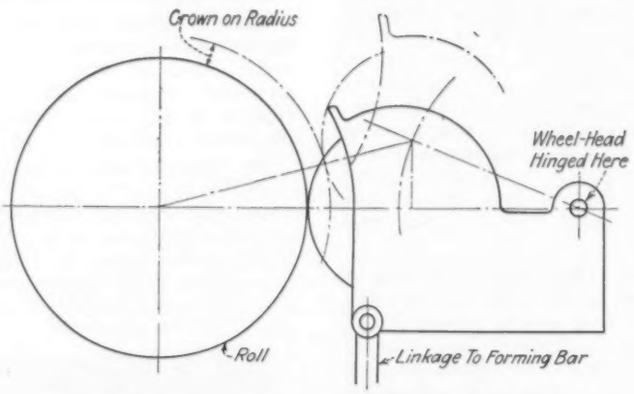


Fig. 3. Diagram Showing Tilted Wheelbase Principle

As will be shown by tabulations for concave shape, change in the total angle of rotation affects the shape considerably. For extreme accuracy, change gears should be selected exactly correct for the roll length. For rolls used for many purposes change gears can be used over a range of roll lengths. This range varies, being greater for longer rolls, the determining factor being the angle of rotation of the eccentric. This angle should not decrease to the point where the deviation from the theoretically correct curve on the roll affects the process for which the roll is used.

Fig. 6 shows a distinct difference between the crown and the concave curves. Whether or not it is necessary to have this difference in curve shape does not appear to be a question for the grinder builder to determine but should be answered by the users of the rolls. The machine

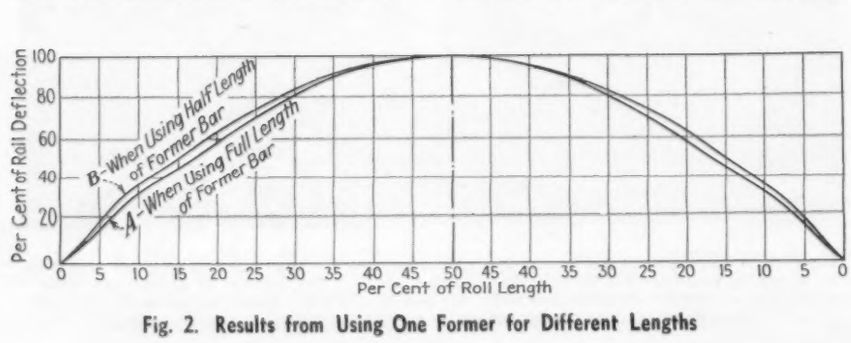

B-When Using Half Length of Former Bar
A-When Using Full Length of Former Bar
Per Cent of Roll Deflection
Per Cent of Roll Length

Fig. 2. Results from Using One Former for Different Lengths

builder should provide a mechanism that will give the convex and concave shapes that the user desires and if a difference exists in these curves, then, to be entirely satisfactory, the cambering attachment should produce either curve.

Actual difficulty experienced with rolls crowned to a shape other than that of a uniformly loaded beam, necessitating making the crowning attachment produce that shape, have indicated to the grinding machine builder the correctness of that shape. However, many concerns using roll grinders are concaving rolls to a curve similar to that given crowned rolls, with satisfactory results, which may indicate that strict adherence to the straight edge cross is not absolutely necessary.

The Straight Edge Cross

Fig. 7 illustrates what is meant by the straight edge cross. A straight edge crossed on the dressed roll at the proper angle produces a straight line of even width from end to end

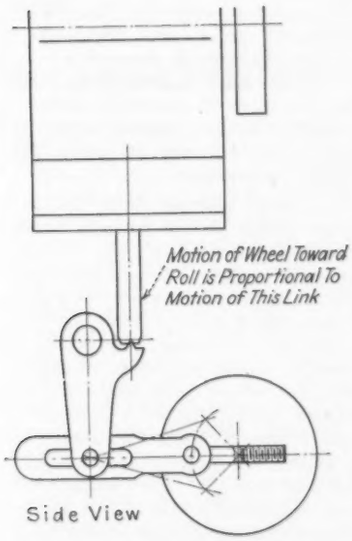


Fig. 5. Typical Linkage for Rotating Former

of the roll, as shown in Fig. 7-a. Fig. 7-b shows a difference in method in that a straight roll is crossed with the concaved roll. It is evident that the only difference in the results of these two methods is that the roll cross produces practically one-half the concavity that is produced by the straight edge, since the straight edge is in a horizontal plane and the center of the crossing roll is also in a horizontal plane but at approximately twice the distance from the center of the roll being measured.

If the curve shape obtained with rolls shaped to a straight edge or roll cross is correct, the roll grinder should duplicate this shape. Articles have appeared in trade papers giving formulas for arriving at the amount

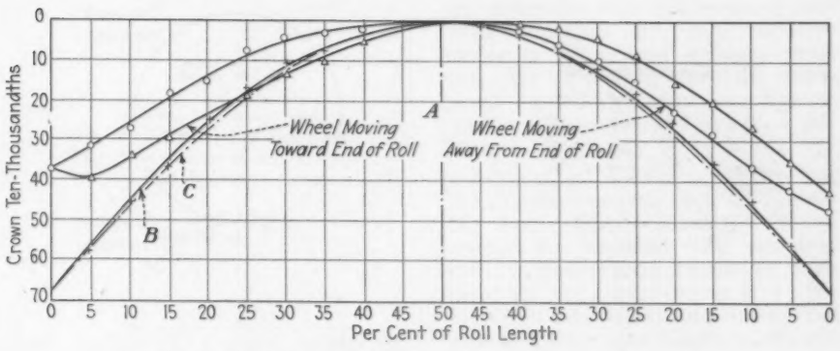


Fig. 4. Illustrating the Effect of Deflection and Backlash

of concavity obtained with a given cross but, so far as this writer knows, no formulas have been published to develop the shape obtained. If a roll grinder is to produce a given shape it is necessary to know the percentage of the total concavity at intermediate points.

In developing a formula for roll shape we need only consider half a roll as the curve is symmetrical. In Fig. 8

R = roll radius at end of roll
C = one-half the cross
h = concavity measured on the radius
L = one-half the roll length
θ = one-half of angle subtended by arc of cross

It is apparent that the total concavity measured on the radius is:

$$h = R - R \cos \theta$$

Also, at intermediate points concavity is

$$h_1 = R_1 - R_1 \cos \theta_1$$

and since straight edge is in horizontal plane

$$R_1 \cos \theta_1 = R_1 \cos \theta.$$

Dividing L into equal parts it is evident that the values of C, C_1, C_2, etc., are all directly proportional and if L is divided into five parts

$C = R \sin \theta$
$C_1 = 4/5\ R \sin \theta$
$C_2 = 3/5\ R \sin \theta$
$C_3 = 2/5\ R \sin \theta$
$C_4 = 1/5\ R \sin \theta$

From the above a definite relation between R, R_1, R_2, R_3, and R_4 can be established

$$R_1 = \sqrt{\tfrac{16}{25} R^2 \sin^2 \theta + R^2 \cos^2 \theta} = \frac{R}{5} \sqrt{16 + 9 \cos^2 \theta}$$

$$R_2 = \sqrt{\tfrac{9}{25} R^2 \sin^2 \theta + R^2 \cos^2 \theta} = \frac{R}{5} \sqrt{9 + 16 \cos^2 \theta}$$

$$R_3 = \sqrt{\tfrac{1}{25} R^2 \sin^2 \theta + R^2 \cos^2 \theta} = \frac{R}{5} \sqrt{4 + 21 \cos^2 \theta}$$

$$R_4 = \sqrt{\tfrac{1}{25} R^2 \sin^2 \theta + R^2 \cos^2 \theta} = \frac{R}{5} \sqrt{1 + 24 \cos^2 \theta}$$

and therefore

$$h = R - R \cos \theta$$

$$h_1 = \frac{R}{5} \sqrt{16 + 9 \cos^2 \theta} - R \cos \theta$$

$$h_2 = \frac{R}{5} \sqrt{9 + 16 \cos^2 \theta} - R \cos \theta$$

$$h_3 = \frac{R}{5} \sqrt{4 + 21 \cos^2 \theta} - R \cos \theta$$

$$h_4 = \frac{R}{5} \sqrt{1 + 24 \cos^2 \theta} - R \cos \theta$$

From these formulas it is apparent that roll diameter has a bearing on the shape due to cross. If the influence of diameter on the shape were too great the setting of the cambering attachment and the selection of proper change gears might be quite complicated. However, within the ranges of roll diameters and amounts of concavity used the effect of diameter is not sufficient to affect results.

To determine the effect of diameter and to establish a general formula for wheel movement we take a 10 in. diameter roll and a 40 in. diameter roll, and 1 in. and .050 in. concavity measured on the diameter.

Then for a 10 in. roll we have

For 1 in. concavity — $\cos \theta = .9$
For 50/1000 concavity — $\cos \theta = .995$

and for a 40 in. roll

For 1 in. concavity — $\cos \theta = .975$
For 50/1000 concavity — $\cos \theta = .99875$

Tabulating the intermediate percentages of wheel movement against percentage of roll length, with the mid point of the roll as the starting point, we obtain:

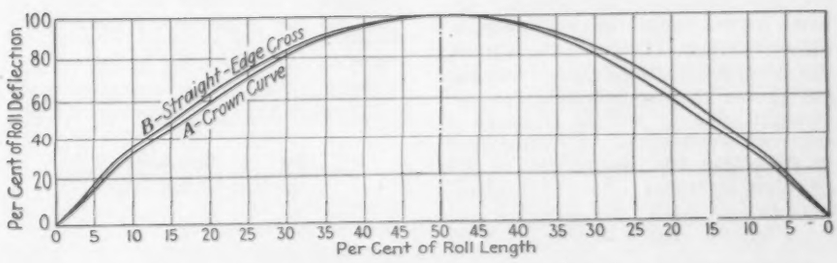
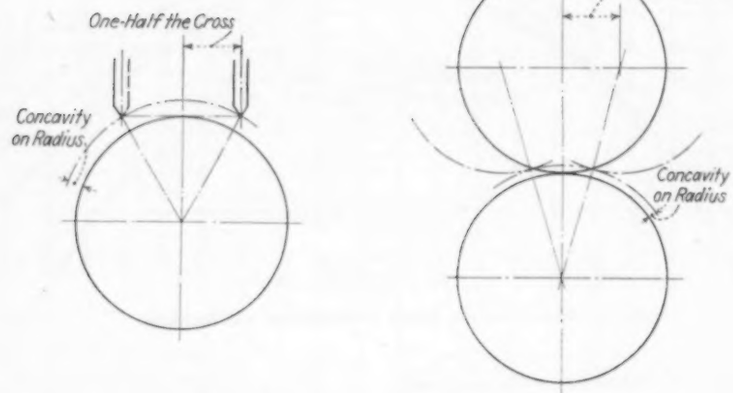


Fig. 6. Comparison of the Crown and the Concave Curves



Figs. 7-A and 7-B. Illustrating the "Straight-Edge" Cross

Percentage of roll.....	0	10	20	30	40	50
10 in. dia., 1 in. concavity.....	0	.04212	.16732	.3723	.65194	1.
10 in. dia., 50/1000 in. concavity....	0	.04008	.16036	.3605	.6404	1.
40 in. dia., 1 in. concavity.....	0	.04048	.1617	.3628	.6424	1.
40 in. dia., 50/1000 in. concavity...	0	.0400	.1600	.3600	.6400	1.

One inch concavity is far beyond practical requirements, especially on a 10 in. diameter roll. Therefore a fair average tabulation would be indicated from the above as

Percentage of roll length...	0	10	20	30	40	50
Percentage of total concavity	0	04	16	36	64	100

Comparing these figures with the movement used for a crowned roll

Percentage of roll length.	0	10	20	30	40	50
Concave.	.00	.04	.16	.36	.64	100
Crown .	.00	.0477	.187	.405	.686	100

it is apparent that the same angle of rotation of eccentric cannot be used for both curves. If the eccentric is rotated 25 deg. each side of the center, the curve follows the requirements of the straight edge cross.

Percentage of Roll Length	*Wheel Movement*	*Required Movement*
10	.0407	.04
20	.162	.16
30	.3637	.36
40	.6437	.64

For ordinary concavities this wheel movement shapes a roll to the shape due to a straight edge cross with errors below .0002 in.

As pointed out above, experience has indicated the necessity for close adherence to the correct crown shape. Therefore, charts* giving the settings for the cambering attachment are based on the correct angle of rotation for crowning. These charts are being used satisfactorily for concaving, but if really close adherence to the straight edge or roll cross shape is required, the angle of rotation should be decreased and the setting of the eccentric increased. For strict adherence to the shape, the grinding machine builder should be consulted for exact angles and settings, but for reasonably close settings the angle can be cut in half and the offset multiplied by four.

*Farrel-Birmingham Co., Inc.

Symmetry of Curve

The second requirement is that the curve shape be absolutely symmetrical each side of the mid point of the roll. With the eccentric type of crowning device correctly applied this is possible.

The eccentric drive is made so that it can be easily disconnected by disengaging a clutch or removing one of the change gears. With the eccentric disengaged the wheel can be centered on the roll and thus synchronized with the center of the eccentric. The movement of the eccentric is the same each side of the center so that the curve shape on the roll will be symmetrical if linkage or mounting does not interfere.

If the eccentric is mounted with its axis parallel to the axis of the roll and the motion of the wheel is thus a bell crank, the roll will not be symmetrical. For years some grinders were built with the eccentric mounted in this way. The error in symmetry with the bell crank leverage used was slight, being about .00035 in. when crowning .040 in. Correction for this slight error in symmetry was made when lining up the roll for grinding. However, the modern device eliminates even this inaccuracy.

Backlash and weakness in linkage systems were mentioned earlier in this article as a cause of trouble, especially as regards symmetry. To insure against backlash on the single wheel machine the wheel base is pivoted on centers and has the eccentric follower mounted on it so that it rests directly on the eccentric itself without intermediate links. The centers insure a minimum of friction and elimination of backlash at this point. No linkage between wheel base and eccentric eliminates the possibility of lack of symmetry due to backlash, difference in friction of sliding parts and reversal of strain at ends and center of roll.

On the two-wheel machine, links are necessary as the two wheel movements must be connected together. Where such necessity exists the number of links should be reduced to a minimum and those used made as strong as possible.

The crowning and concaving device must be set easily and quickly. The time taken for changing the setting from crown to concave, for different lengths of rolls and for different amounts of crown or concavity is serious if of any appreciable length. With the modern eccentric device the two adjustments (change gears and offset eccentric) can be easily made within two minutes.

The same setting with the same change gears should always produce the same shape on a roll. This requirement might be modified to include rolls of the same composition and exactly the same wheels. These compositions of roll and wheel undoubtedly have an influence on roll shape, for wheel wear may vary over the same roll lengths if rolls or wheels vary. However, these two factors are not within the power of the machine builder to control. They influence the shape of straight rolls quite as much as they influence contoured rolls. The eccentric device will produce exactly

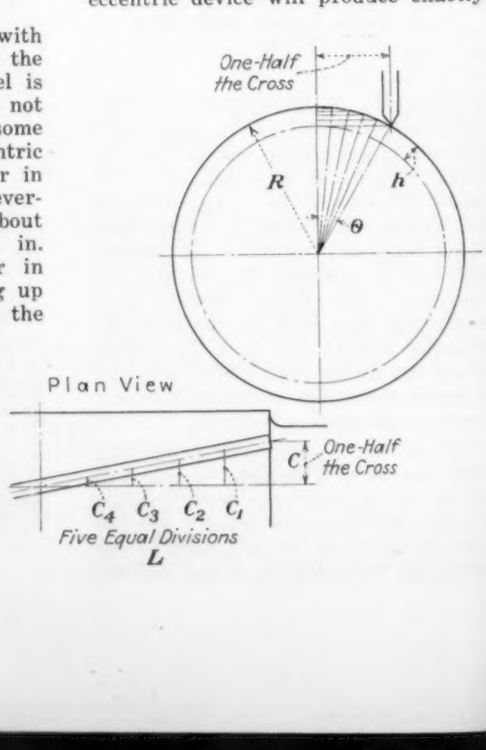


Fig. 8. Developing a Formula for Roll Shape

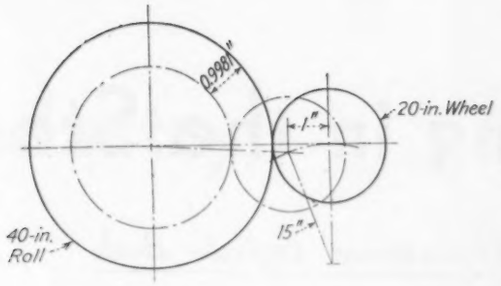
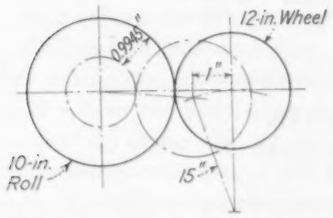


Fig. 9. Difference in Crowning Due to Variation in Wheel and Roll Diameters



the same shape if the setting and gears are the same and provided the wheel is handled with the same care exercised in grinding a straight roll. It will do this because the motion of the wheel in and out is exactly the same under these same conditions.

The amount of crown or concavity should not be affected by roll or wheel diameter. With the wheel mounted in relation to the crowning device eccentric, as it is, on one arm of a bell crank, there is some slight effect due to change of roll or wheel diameter. However, this effect is negligible. Fig. 9 illustrates the manner in which the wheel is mounted and shows the difference in amount of crown or concavity as the total difference in wheel and roll varies through 19 in. As shown for a wheel movement of 1 in., there is a crown or concavity of 2 in., the difference over this range is only .0036 in. Two inch crown or concavity is far beyond ordinary practice. For crowns or concavity within usual limits the difference is not measurable. Theoretically there is a difference, practically there is not.

In the above it has been shown that the present eccentric type of cambering device will produce the correct shapes for crowned and concaved rolls. These correct shapes are indicated as the elastic curve of a uniformly loaded beam for the crowned rolls and the curve true to a straight edge cross for concaved rolls. Some doubt is indicated as to the proper shape for concaved rolls; also conditions, such as tendency of journals to heat unduly, may necessitate a slight departure from the indicated theoretical shape in actual practice. The eccentric curve varies with the angle of rotation, affording some opportunity to deviate slightly from the theoretical shape to compensate for local or special conditions. With the present requirements for the products of the rolls becoming increasingly rigid this feature is of importance.

Decentralization Aids Manufacture of Diversified Products

AN organization manufacturing diversified products involving variations in size, quantity and type of product, seasonal changes, style tendencies, special materials and processes, not to mention an endless procession of new developments, is faced with many production problems. The solution of these problems usually requires decentralization both in separate manufacturing plants and in the departmentalization of the individual plants, said A. F. Murray, industrial engineer, Westinghouse Electric & Mfg. Co., in addressing the recent Chicago meeting of the American Society of Mechanical Engineers.

The early conception of manufacturing as divided up according to size and type of operation, such as large and small foundry, machine shop and assembly departments, with subdivisions such as lathe, planer and drilling departments, long ago gave way to breakdowns by types of apparatus, such as railroad motors, generating apparatus, industrial motors and control, transformers, switchgear, metering instruments, small motors and motored appliances, lighting equipment, steam turbines, domestic and industrial electric heating equipment; and recently refrigeration and air conditioning.

Each Department Becoming More Self-Contained

At first these major subdivisions were set up merely as separate assembly departments; machining of major parts was later added and also equipment for special processes peculiar to the product of a particular division.

Many general feeder sections formerly supplied these subdivisions. Over a period of years the tendency has been to provide each of these divisions with the more essential of these feeders and to further subdivide the assembly and principal part machining of the major divisions. The manufacture of each product is becoming more self-contained and direct-flowing. This change has not come suddenly, according to Mr. Murray. It has been a steady evolution, taking advantage of individual developments in facilities and methods introduced into industry through the years.

There have been many factors besides increased volume which have made these changes possible. Some of the more important are developments in material handling, improved raw materials, more accurate process control, improvement of machine tools, improved types of finishing machines, individual electric drive for machine tools, electric heating, welded construction, improved cutting tools, time and motion analysis, incentive wage payment plans, industrial cost accounting, free interchange of information, and development of specialty organizations.

There is no industry so special as not to benefit by a study of its practices to determine whether it is applying all the knowledge which is available in other industries.

Factories Within a Factory

The products of an organization with diverse activities should be classified, and control of sales, engineering and manufacturing of each major group carefully coordinated. In the Westinghouse company the heads of sales, engineering and manufacturing divisions form an "Economic Group," and as such are responsible to the general management for policies of their division. This arrangement tends to make the actual manufacturing divisions become finished product factories relying as little as possible on general feeder sections. The problem has been to determine the extent to which division and duplication of feeders is profitable and the extent to which assembly and major item manufacture should be subdivided.

Where complete new facilities must be provided, the present tendency is to provide more complete decentralization than where a rearrangement of existing facilities is under consideration. The size of the unit is important. The smaller the special setup, the less is the justification for supplying the plant with its own feeder sections.

Permanence of Market Is a Consideration

Other factors controlling feeder activities are permanence of product market, extent of seasonal changes in design and in quantity, capital outlay required, special training or development required, facilities available elsewhere in the organization, facilities available elsewhere outside the organization, importance of quality and quantity control of the item involved, possibility of reduced work in process, and probability of future use of equipment for other purposes should the particular item be discontinued.

Welding in the Steel In

Maintenance Applications Include Both Large and Small Units

By C. M. TAYLOR
Vice-President, Lincoln Electric Co., Cleveland

AS arc welding first came into prominence as a maintenance tool, it is natural that it should be used extensively for that purpose in steel plants today. More and more welding is cheating the scrap pile and adding years of life to equipment which a few years ago would have been discarded.

Yet many mills are not utilizing the full possibilities of welding in their repair work. Consider, for example, the maintenance of overhead cranes. Arc welding will stiffen the bearing brackets where rivets have worked loose. By welding the end trucks to the bridge girders the weave will be taken out of the trucks.

Table rollers with worn necks can be put back into service as good as new by building up the necks to their original size. Worn spindle wobblers can also be built up. Broken charging boxes and billet baskets can be repaired. Structural parts can be strengthened. Scrap can be utilized to fabricate dozens of small miscellaneous parts and pieces of equipment such as tables, trestles, racks, shelves and tote boxes. Worn car wheels and worn rails can be built up. Leaks in pipe can be repaired and entire piping installation made with arc welding. In fact the possibilities for the use of arc welders in the maintenance department are innumerable.

Several large maintenance jobs which illustrate aptly the use of the arc welder will be outlined here.

Mill Housing Altered

In a mill in Germany the problem of altering existing rolling equipment to permit the rolling of new shapes arose. Since the rolls had to be put in place from the side through one of the two roller supports, the latter had to be made wider than the diameter of the rolls. Thus a new support was necessary. As a new support weighs 36.6 metric tons and would cost about $2,750, it was decided to alter the existing support with the aid of the electric arc.

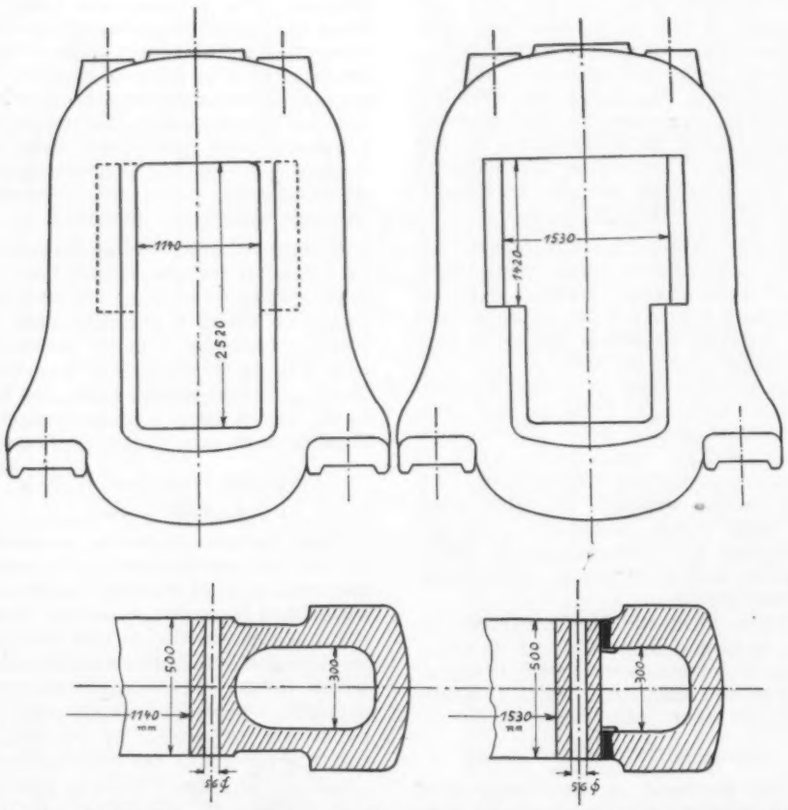


FIG. 1.—Mill housing altered to permit rolling of new shapes. Before and after alteration is shown at left and right, respectively. The dotted lines indicate the section cut away. The cross section before and after alteration may be seen in the lower sketches.

Using an autogenous cutter, the inside width of the roller support was increased from 1140 mm. to 1530 mm. in a length of 1420 mm. The part cut off is indicated in Fig. 1 by dotted lines. The procedure was such that pieces of 200 mm. each were cut off and the remaining parts electrically welded as shown.

The two lower sketches in Fig. 1 show the cross section before and after alteration, and also the cross section of the joint. The entire cost of alteration amounted to approximately $240, representing a saving of 91 per cent over the cost of a new housing. Fig. 2 is a photograph of the support; note the use of intermittent welds.

The manipulator for a 1000-ton forging press that had broken in two places was repaired and put back in service in 42 hr. In a letter to the author the plant making the repair said: "The actual time to prepare and weld was 18 hr. with 24 hr. heat treatment. The weld is entirely satisfactory and often subject to 150 per cent overload."

Pumps Reconditioned

In order to use again the cooling water for rolls, a centrifugal pump removed the water from a pit below the rolls. This water contains considerable quantities of slag and cinders which wear the pumping equipment. Pump casings as shown in Fig. 3 on the right wore out quickly, necessitating replacement. The defective parts were repaired by welding on new material. Even then the cost of maintenance was high. The mainte-

l Industry

ALTHOUGH welding has been used extensively in repairing and rebuilding steel mill machinery, its full possibilities as a maintenance tool have not been utilized by many mills, states the author, who cites several examples of economical reconditioning of mill equipment. This is the fourth and concluding article of the interesting series by Mr. Taylor.

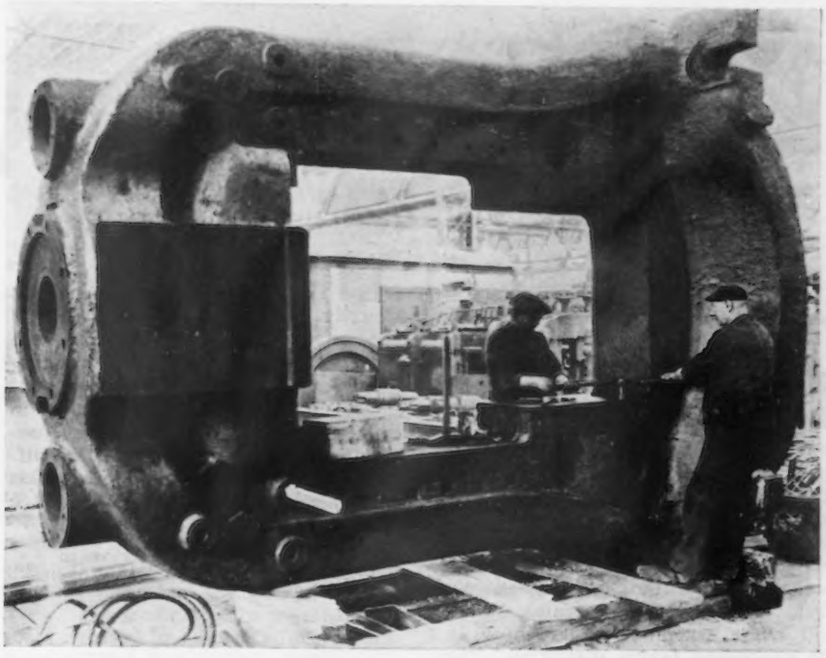


FIG. 2.—Mill housing after alteration by arc welding. The cost was about $240 as compared with about $2,750 for a new roller support.

nance department then suggested building these pumps of welded steel.

This was done with the result shown at the left in Fig. 3. Flat and cylindrical surfaces only were employed. All parts subject to wear were lined with high-grade steel sheets welded to the inner wall of the casing. When the lining wore out it became necessary only to remove it and weld in a new one from stock. The cost of repairs was decreased to 33 per cent of the previous cost.

Rebuilding Bar Mill Rolls

The welding process is particularly well adapted, of course, to the building up of worn surfaces or to increase the size of a given part by adding weld metal. In this connection it is interesting to note the accomplishment of one large steel plant in rebuilding a set of rolls.

The mill required a set of rolls with a reduced pass to take care of a certain order. A new set of rolls was out of the question because of the cost and delay involved. The welding department was consulted and it was decided to rebuild a pass on a 54-in. blooming mill roll.

The pass was originally 30⅛ in. wide. This was reduced about 8 in. by the arc welding process and then machined to 23½ in., leaving a solid weld 3 5/16 in. on all sides. (See Fig. 4.) This required 6200 lb. of ¼ in. electrode and 2000 man-hours. The total cost was approximately $1,700. The mate of this roll may be also seen in the illustration. Both rolls have a total weight of about 77 tons and cost about $9,500 per set.

After having rolled more than 18,000 tons the rolls are still serviceable and have required no repairs. The welded pass is where the ingot first passes through. A similar 44-in. blooming mill roll has rolled 50,000 tons and is still serviceable.

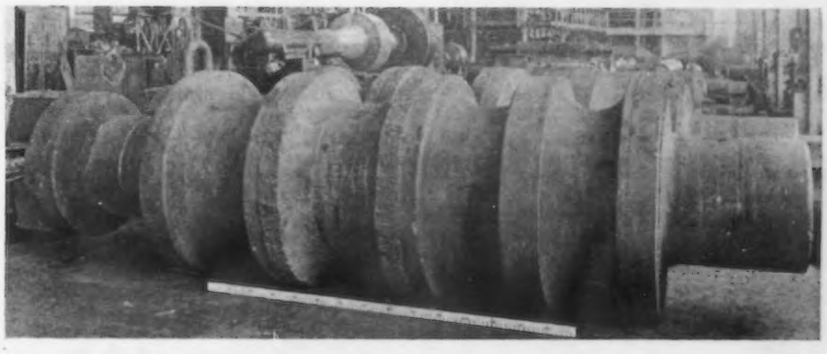


FIG. 4.—Rebuilding of one pass on this 54-in. blooming mill roll permitted rolling of special bars.

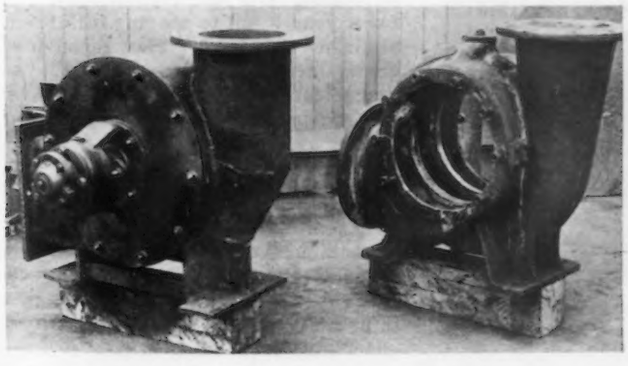


FIG. 3.—Defective parts of the pump casing shown at right, which wore out quickly, were repaired by welding on new material. The welded steel pump at left has replaceable wearing surfaces; when the lining wears, it is removed and a new one is welded in place.

Hardening and Cyaniding of

AS everything in hardening favors distortion, the slogan of the gear cutter when confronted with noisy gears: "They distorted in the fire," is no myth, states Mr. Davis in this article, a continuation of the one in THE IRON AGE of July 27, page 8. The cyanide method of hardening is held to be most popular, probably 75 per cent of gears now produced being hardened by this process. Mr. Davis dispels the impression that cyaniding makes noisy gears and emphasizes the better wearing qualities and decrease in breakage obtained. "Save the surface and you save all" applies to gears as well as to paints, he states.

THE operation of hardening a gear always produces internal changes in the steel. The metamorph from pearlite to martensite is accompanied by a change in volume. The surface of the metal is subject to oxidation and corrosion by furnace gases. They are expanded when they are being heated and contracted when they are quenched. The thin sections will cool first, thus producing strains which will cause warping. Everything in the hardening favors distortion. The slogan of the gear cutter when he is confronted with noisy gears has always been "They distorted in the fire," and this is no myth.

Oil-hardened gears almost invariably expand permanently in the hardening, and this, of course, increases the diameter of the pitch circle. This increase usually approximates 0.001 in. per inch of diameter. Thus 12 gears measuring 3.773 in. in diameter expanded on the pitch diameter an average of 0.0033 in. Twelve gears measuring 6.472 in. expanded an average of 0.0055 in. and a third lot of gears measuring 2.917 in. expanded 0.0024 in. average. This expansion is not always uniform. Design and hardening temperature are also factors. Thus if the gear were a thin ring it might not expand but actually shrink. The permanent expansion also increases with the corresponding increase in hardening temperature. Thus a 0.40 per cent carbon chrome-steel hardened in cyanide showed the following permanent increase in diameter at different hardening temperatures. This gear measured 3.553 in. on the pitch line.

Hardening Temperature, Deg. F.	Increase in Diameter, Inches
1400	0.0022
1480	0.0025
1500	0.0031
1525	0.0037
1550	0.004

The rule of 0.001 per inch of diameter is generally true and is used by us in maintaining our backlash within the close requirements demanded by some of our customers.

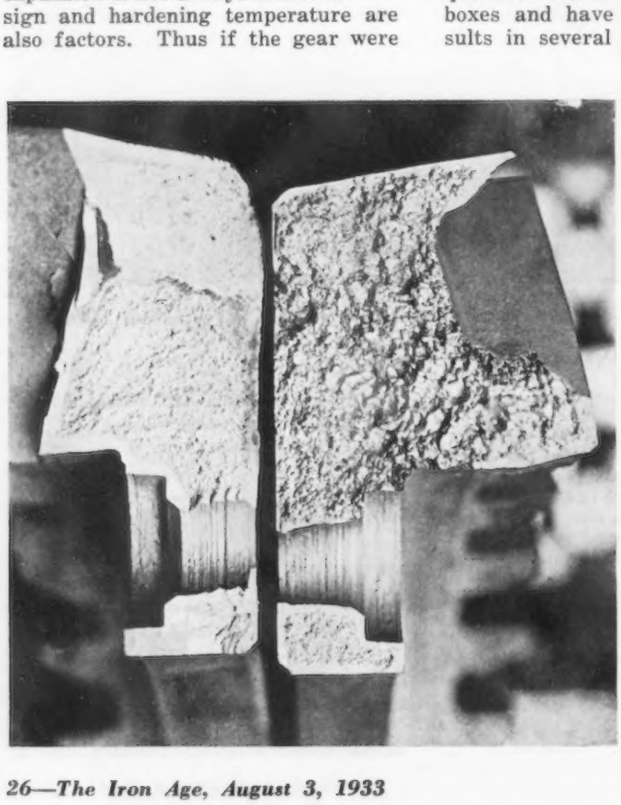
Less Distortion from Fine Grained Steels

As a general thing the lower the hardening temperature the less will be the distortion. On the other hand, the type of steel employed is a factor. The fine grained electric furnace steels, such as the nickel and chrome nickel molybdenums, have been quenched direct from the carburizing boxes and have shown excellent results in several plants. Our results with this method have not been as gratifying as we anticipated. Nevertheless, it is a fact that these fine grained steels do not change as much in heat treatment as many of the coarser grained varieties.

When carburized gears are hardened the movement is toward the hole. Hence we generally term this as shrinkage. The periphery under good hardening practice changes very little. It would seem therefore that there are greater possibilities for quiet gears from the low-carbon steels than with the oil-hardened type, and to a great extent this is true. The carburized gear got a black eye when gear cutting methods and machines did not have the accuracy they have at present. Carburizing was a crude process, normalizing was not practiced, steels were of poor quality and steel metallurgy was in its infancy. We manufacture from both carburizing and oil hardening gear steels, and in looking over our rejection records for a year I fail to see any difference between the two. The carburized gears, incidentally, are used in passenger cars of the higher class where the standards for quietness are more severe.

Rate of Quenching Important

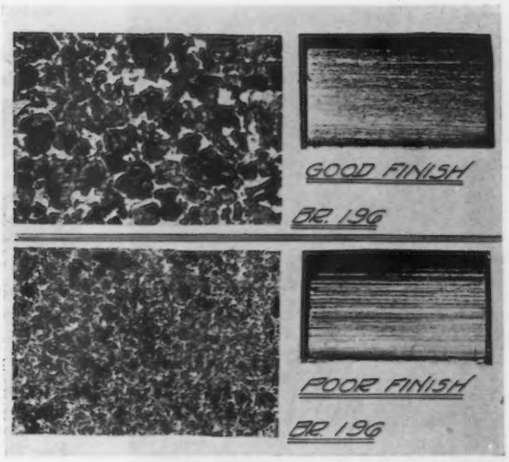
The rate of quenching is one of the most important factors in gear distortion. For example, if we quench gears in water we would expect them to be noisy and for that reason water quenching is avoided whenever pos-



OVERHEATED ring gear, showing typical coarse fracture, compared with properly heated gears

g of Steel Gears ▲ ▲ ▲

By E. F. DAVIS
Metallurgist, Warner Gear Co., Muncie, Ind.



EFFECT of microstructure on tooth finish. As both specimens are of the same Brinell hardness the microstructure rather than the hardness is taken as the index of machineability. Preponderance of lamellar pearlite is aimed at to assure best finish in cutting the gear.

sible. Yet oil, although milder in quenching effect, may be too severe for gears with fine pitch teeth or thin sections. The oil quench may be modified by heating the oil and by avoiding agitation of the parts in the quenching bath. On the other hand, large gears may require considerable agitation of the gear in oil to produce the necessary hardness. It would be safe to predict that a very large gear could be water quenched with less danger of distortion than a very small gear in oil. The point I desire to make is that quenching conditions must be adjusted to the mass to be hardened and the cooling rate not be excessively fast but sufficiently rapid that the desired hardness is maintained.

We have one customer who demanded that the pocket or bearing hole of a main drive gear be equally as hard as the teeth due to the employment of a roller bearing in this pocket. The steel was somewhat low in carbon, and to accomplish the results desired it was necessary to flood the hole with a spray of oil under pressure. This, of course, intensified the quenching effect. Immediately the plant was involved in a high percentage of noisy transmissions. By modifying the spray the rejections were lowered but still remained excessively high. The carbon content of the steel was increased and the spray eliminated entirely, whereupon the rejections became normally low and practically the same as they had been before the spray was inaugurated.

Strains Develop in Cooling

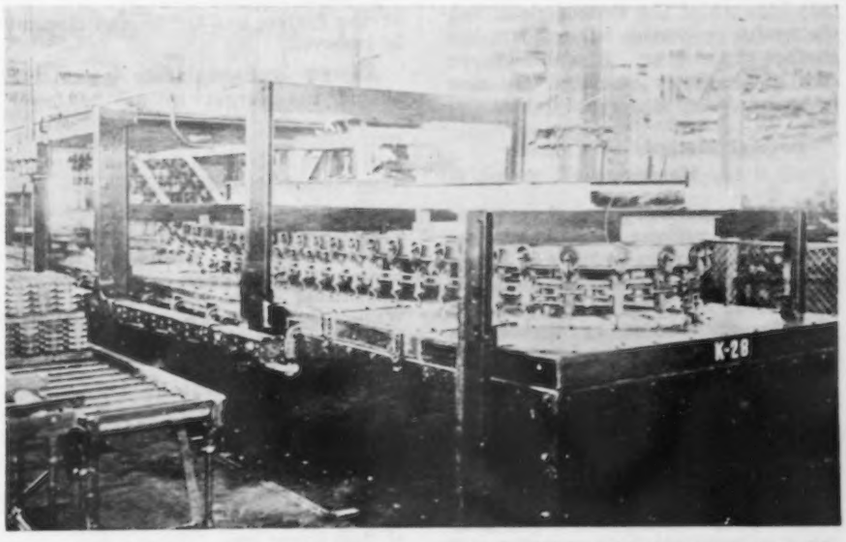
The same would apply to hardening temperatures. A small gear might distort excessively at 1500 deg. F. whereas a large gear may be hardened at 1650 deg. F. without any harmful effects. The actual distortion, however, does not occur in the difference in the heating temperature but occurs in the quench. Gear steels do not develop strains while being heated. It is in the contracting or cooling period where the actual movement occurs.

Each time a gear is re-treated the amount of distortion increases. The maximum change occurs in the first treatment but every subsequent re-hardening and quench increases the involute error and the growth of the steel. We re-treated a number of gears rejected by our metallurgical inspection and found that these gears showed much higher rejections on the test stand than standard production. It was formerly the practice to double heat-treat carburized gears. This is one of the explanations for noisy carburized gears and has been largely abandoned by gear hardeners.

Many Types of Hardening Furnaces

The hardening of gears is done in many different types of furnaces. The first and oldest type is the square stationary furnace. The stationary electric furnace enjoyed a brief period of popularity. The lead bath, the rotary hearth, the Hump furnace and finally the cyanide furnace have succeeded each other during the last ten years.

The old type square furnace has hardened many gears and was used for a number of years in the earlier days of the gear industry. It was difficult to harden gears uniformly in it as the gears scaled excessively. It is seldom used at present except in small job shops. The stationary electric furnace gave less scale and hardened more uniformly but had the bad habit of decarburizing the surface. It was also expensive to operate. The rotary electric was not a success due to the hard tenacious scale produced. One firm was compelled to copper plate all their gears hardened in this type of furnace. Rotary, gas and oil furnaces were more successful and are still being used by many companies for hardening both differential and transmission gearing and do not have the faults of the electric type. The electric tunnel-type being open at both ends also does not have the bad



CONTINUOUS salt bath tempering furnace. The gears come to the furnace on the roller conveyor shown at the left, are loaded on hooks suspended from chain-driven rollers, as shown, and carried through the bath continuously.

CYANIDING should be regarded as a semi-nitriding process since nitrides as well as carbides constitute the case. This is a reproduction of photograph showing nitride needles in the case—a rare photograph because these needles are very difficult to isolate.

atmospheric conditions of the stagnant rotary and stationary electric types.

The lead pot has been a favorite method for heat treating gears and is still in use in many plants. The chief objection to this method of hardening is the adherence of the lead to the parts and the inability to control the temperature due to its high heat conduction.

At present the cyanide method of hardening is the most popular not only because of the method itself but the useful properties imparted to the surface of the gear. Probably 75 per cent of the gears produced are now being hardened in a cyanide bath.

Several Methods of Cyanide Hardening

There are several ways of performing this operation. One is by preheating the gears in a rotary or Hump furnace and then giving the gears an immersion for about 1½ min. in cyanide, another is by direct immersion in a stationary furnace, and the third is by the continuous cyanide furnace. The cyanide method is of such importance that some of its metallurgical features will be discussed.

Many gear makers still hold a prejudice against dipping a cold gear into a molten bath, believing that this act produces distortion. There is a fostered belief that unless steel is heated slowly and carefully it will warp, and to take a cold gear and plunge it into a molten mass of salt is violating all principles of good heat-treating practice; and they prefer to preheat the gear and merely dip it into the cyanide after it has had the slow and careful treatment. This is the so-called cyanide dip method. When such a gear is first placed in the cyanide bath a more or less violent reaction occurs due to the cyanide attacking the oxide of iron on the gear surface, for cyanide is a solvent for oxides. In about a minute this reaction subsides and the gear may then be removed and quenched. As quite a bit of cyanide adheres to the surface, the take-out loss is high. For that reason the cheaper grades of cyanide such as the 45 per cent should be employed. The cyanide-dipped job is not file hard and the case is comparatively low in nitrogen.

The direct cyanide gear is immersed in the cyanide bath without any previous pre-heat except drying and brought up to temperature in the cyanide itself; after a definite period, which seldom exceeds an hour, it is removed from the bath and quenched.

Continuous-Type Furnace Closely Controlled

In the continuous type the work is carried through the bath by means of a conveying mechanism exterior to the bath itself. This latter type of furnace may be controlled automatically within 20 deg. F. due to the fact that at no time is any heavy mass of metal added to the bath. The pots used are of necessity large in dimensions. We employ the screw type conveyor. The Buick furnace has a rotary mechanism, and is circular and of doughnut shape. These furnaces are practical only for firms having considerable production. Another advantage of the continuous type is that the time in the cyanide furnace is regulated mechanically by the conveying system and the human element is removed.

Anyone contemplating cyaniding should not forget to use a lower carbon steel than would be necessary for the furnace-treated oil-hardening grades. Thus a 0.50 per cent chrome steel would be too brittle when cyanided. A 0.40 per cent carbon chrome steel would have the same impact values of a 0.50 per cent carbon chrome steel. The cyanide process should be regarded as a semi-nitriding process for nitrides as well as carbides constitute the case.

The latest modification of the cyanide process is the energized bath of which the aero case method is representative. This produces a case similar to cyanide but is somewhat higher in carbides and lower in nitrides. In this type of bath a neutral salt melting at about 950 deg. F. is used. To this are added various activating agents of which calcium cyanide is typical. Some objection to the use of calcium cyanide is its decomposition into lime which is difficult to wash from the surface.

Wearing Qualities Feature Cyanide Case

The advantage of the cyanide case is its excellent wearing qualities. In our dynamometer tests we have found the cyanide case to be the best wearing of any kind of tooth surface. Taking the furnace hardened gear steel of 0.50 per cent carbon as a unit or base, our dynamometer results indicate that the cyanide-dipped case will give four times the wear of the furnace hardened, the carburized surface eight times the oil hardening furnace treated steel, and the cyanided surface 11 times the wear of the furnace-hardened gear. It will be noted that the cyanided gear wears even better than the carburized gear. This is due to the extremely hard nitrides of the cyanided case. The extreme outer layers for a depth of 0.0005 in. will show a nitrogen content up to 14 per cent. Although the preceding results are based on the time required for overloaded gear teeth to show pitting, yet in actual field results a worn or pitted gear is very rare.

Another myth I would like to ex-

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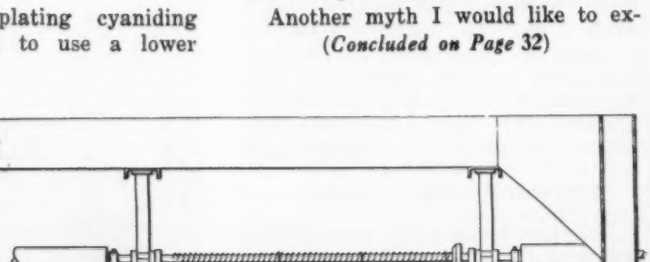

SKETCH showing operation of Davis continuous cyaniding furnace, 14 of which are installed at the Warner Gear Co. plant. The pieces, all or part of which are to be cyanided, are suspended in the bath as shown, and carried through the tank by means of the coarse-pitch motor-driven overhead screw. There is a pair of these screws over each furnace.

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Heat-Resisting Steels of the Present Day

By FREDERICK M. BECKET
President, Union Carbide & Carbon Research Laboratories, Inc., New York

PRESENT heat-resisting steels contain generally from about 4 to 35 per cent chromium, with or without nickel contents in a more or less similar range. These metals further contain varying amounts of carbon, and in some cases appreciable quantities of other elements, such as silicon, aluminum, copper, tungsten, molybdenum and manganese. It is realized that a large number of excellent heat-resisting articles are made from such nickel-base alloys as nichrome and chromel, but they will not be included in this discussion which concerns materials containing at least 50 per cent iron.

Large tonnages of the 5 to 6 per cent chromium steels with and without small additions of tungsten or molybdenum are used as tubing in oil-cracking stills, hot oil transfer lines, heat exchangers, bubble tower caps, return bends and headers. Furthermore, castings of these steels have given good service in the replacement of cast iron, which grows to a greater extent under the influence of heat.

Boiler Tubes of 12 Per Cent Chromium

Steels containing 7 to 9 per cent chromium, especially in conjunction with silicon or aluminum, have long functioned satisfactorily as valves in internal-combustion engines. One of the most important of the chromium steels is the type containing 12 to 14 per cent chromium with moderately low carbon. Steels of this class have found large outlets as steam-turbine blades, valve stems, and disks used in high-pressure steam lines. At present a large use in steam boilers is contemplated for seamless tubes containing approximately 12 per cent chromium. It is believed that in the near future steels of this class will be so improved through the addition of other elements as to render them applicable under even more severe conditions of temperature and corrosion.

Next should be discussed the steels having still greater chromium contents, extending to 18 per cent, and further from 20 to 30 per cent or even higher. These steels have been found to possess in the cast and wrought states remarkable resistance to oxidation at elevated temperatures. If temperatures of 1000 deg. C. or higher are to be employed, it is necessary to have a minimum chromium content of 20 per cent. While these steels provide excellent resistance to oxidation, they are not so strong as the metal in which nickel has also been incorporated. Although these higher plain chromium steels develop grain growth at extremely high temperatures and also become embrittled if cooled slowly through a comparatively narrow range of temperature below a dull red heat, they nevertheless are the most satisfactory materials for a wide variety of applications, especially where resistance to sulphur-containing gases at high temperatures is required.

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A SUCCINCT outline of the present array of heat-resisting steels and the uses to which they are put is here made available in an abstract from an address by Dr. Becket at a recent meeting in New York on heat and corrosion-resisting steels. The meeting was staged by district chapters of the national mechanical, metallurgical, welding and electrochemical engineering societies.

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Seamless Tubes for Temperatures Above 1800 Deg. F.

Notable applications for these steels may be found in supporting disks in furnaces for normalizing sheet steel, and in waste heat recuperators. Seamless tubes from these higher chromium steels have greatly widened their use. Such tubes are now being used as soot blowers in power plant installations, and as superheaters operating at high temperatures. Investigation has also indicated that seamless tubes of the steels containing over 20 per cent chromium can be economically employed as muffles in furnaces for the heat treatment of wire.

Plain chromium steels have been found suitable for the reclamation of sponge iron resulting from the production of copper. Trays made from wrought steels containing 25 to 27 per cent chromium have given good life in operation at temperatures in the neighborhood of 1050 deg. C.

The cement industry has also found a place for high-chromium steels in the form of liners, pug mill blades, tubes, hangers and saddles, in some of which uses the steel must withstand abrasion as well as oxidation at high temperatures. High-carbon, high-chromium steels have resisted for long periods the severe abrasion and oxidation to which rolling mill guides are continually subjected.

As previously indicated, nickel in collaboration with chromium exerts a strong influence on the properties of the high-chromium steels at elevated temperature. Nickel increases the strength and toughness and decreases grain growth and embrittlement, thereby greatly extending the utility of these steels. In many of their present uses the chromium-nickel steels have replaced the plain chromium steels.

Widening Use of the 18 and 8 Steels

For moderately high temperatures where high strength is required, the well-known 18 per cent chromium-8 per cent nickel steel has served admirably both in the form of castings and wrought products. Although some difficulties have been encountered, this steel has given excellent service in the form of tubes and headers used in the oil-cracking process. Perfection has not been attained owing to intergranular corrosion, which develops on long-time holding within certain temperature ranges, especially in the presence of sulphur-bearing gases or other corroding media. Naturally

(*Concluded on Page 66*)

Castings That Keep Strength and Sh

By THOMAS J. WOOD
Bayonne Laboratory, International Nickel Co., Inc., Bayonne, N. J.

IT has been demonstrated that the growth of cast iron which takes place at temperatures above the critical range is much greater than that which takes place at sub-critical temperatures. The hypothetical curves shown in Fig. 11 illustrate the wide variations in growth which different temperature conditions may cause in a plain 2 per cent Si cast iron.

While the maximum amount of growth which may be anticipated in plain cast iron at sub-critical temperatures is generally in the order of 5 to 6 per cent, this is sufficient to render useless castings such as internal combustion engine parts, steam turbine casings, valve bodies, etc., for not only are difficulties met in the change of size, but in the loss of strength as well.

Although the majority of the previous investigators ascribe the cause of the growth of cast iron at relatively low temperatures to the decomposition of the combined carbon into ferrite and graphite, it is apparent that there must be an additional factor. Referring to the growth data cited in Table II (THE IRON AGE, July 13, page 13), it will be recalled that the plain iron had increased in volume 4.17 per cent after 662 hr. of exposure at 1100 deg. F. (600 deg. C.). Since this iron originally contained 0.56 per cent combined carbon, the volume increase due to graphitization would be about 1.15 per cent at the most. Obviously, the 3 per cent difference between the calculated and observed growth must be due to one or more causes besides graphitization.

Although no evidence of internal oxidation was ever observed in the low temperature tests, this source of growth nevertheless remains a strong possibility. Nor is it unreasonable to suppose that occluded gases play almost as large a part in the growth of iron at sub-critical temperatures as they do in the more elevated temperature ranges. However, regardless of whether just one or both of these factors contribute to low temperature growth, it is apparent that graphitization of the combined carbon invariably attends any appreciable increase in volume. It may be added that graphitization is brought about by the migration of the carbides to the original graphite flakes, where they are then broken down into graphite and ferrite.

A natural conclusion from the above comments is that anything which prevents the decomposition of the combined carbon in cast iron will also prevent growth. Silicon, of course, strongly favors this decomposition. The action of nickel as a contributory factor in the deterioration of the matrix of heated cast iron is not so strong as one might suppose, as evidenced by the test data on the automotive iron (Table II). Chromium has the effect of stabilizing the combined carbon, so that when it is used in conjunction with nickel in a low-silicon iron, a strong, tough, and machinable growth-resistant casting may be expected.

The excellence of the Ni-Tensyl type of nickel cast iron as a growth resistant material for the sub-critical temperature ranges probably is due to a combination of well isolated graphite flakes (longer time required for carbide migration), and an unusually strong matrix (which resists the pressure of occluded gases).

Ni-Resist has been found to be of exceptional value as a growth-resistant iron, and, in general, suffers no permanent loss of strength when heated at sub-critical temperatures.

The accompanying compositions are recommended for the temperature range of 60 to 1200 deg. F. (15 to 650 deg. C.).

Variations of these compositions may be made to suit individual cases, but in the Ni-Cr type of iron it may be stated that a ratio of either 2 Ni : 1 Cr, or 3 Ni : 2 Cr, is preferable. Growth-resistant irons with lower silicon contents than those specified will tend to have less desirable machining properties.

The tests made at temperatures *above* the critical range of cast iron confirm the observations of many of the previous investigators. In an oxidizing atmosphere growth is due to oxidation of the matrix, occluded gases, and the decomposition of the combined carbon. Repeated heating will cause an iron to grow more rapidly than steady, prolonged heating, due to the "respiratory" effect. Increasing amounts of silicon (up to about 4 per cent) cause progressive increases in the rates of growth, so that by lowering this element and adding nickel to make the iron gray and machinable a growth-resistant composition may be obtained.

Cast Irons Recommended for Use at Temperatures Up to 1200 Deg. F.

Type of Iron	TC	Si	Ni	Cr	Mn	Cu
Ni-Cr	3.10-3.25	1.25-1.50	1.00-2.50	0.50-1.25	0.60-0.80	....
Ni-Tensyl	2.60-2.80	1.50-1.75	1.25-1.75	.....	0.60-0.80	....
Ni-Resist	2.90-3.10	1.25-1.50	14±	2.0-5.0	0.80-1.0	6±

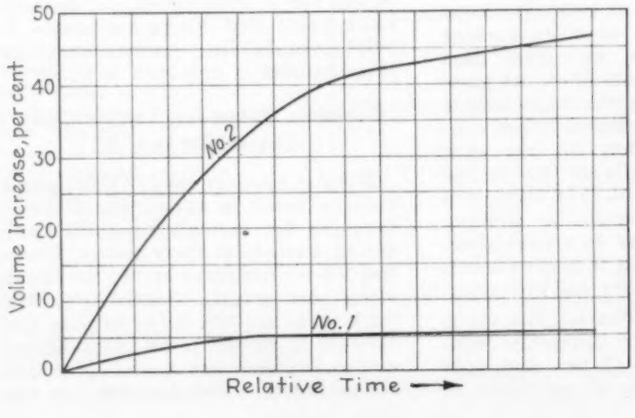

FIG. 11—Growth of plain gray cast iron. Hypothetical curves depicting rate at which growth takes place. Curve 1 is typical of sub-critical temperature conditions, while curve 2 illustrates the growth obtained at temperatures above the critical range

d Shape at High Temperatures ▲ ▲ ▲

THE analyses of nickel-alloy castings that will withstand operating conditions of either high temperatures or oxidizing atmospheres or both are here offered by the author, who describes investigations made at the research laboratory of the International Nickel Co. Maintenance of shape and strength are paramount requirements in cast iron for automotive cylinder blocks, steam turbine parts, valve bodies, for high temperature service, parts of stokers, permanent molds and the like. This article is the concluding portion on an extensive study of the growth of castings in moderately high and very high temperatures, the other parts appearing in THE IRON AGE of July 13 and July 27.

However, attention should be directed to the fact that nickel *lowers* the transformation range of cast iron, and, in the event that any given application would involve temperatures in the region of 1200 to 1300 deg. F. (650 to 700 deg. C.), it is conceivable that a plain 2 per cent Si iron would display better growth-resistance than a low Si, high Ni composition, due solely to the fact that the temperature was *below* the transformation range of the plain iron, and *above* the transformation of the alloyed iron. For this reason it is generally safer to use the combination of Ni and Cr, since Cr not only tends to raise the transformation ranges but also stabilizes the combined carbon.

It should also be noted that plain irons of very low silicon content, or irons containing high "unbalanced" amounts of chromium, are likely to be white or mottled in their structure, and therefore extremely brittle. Difficulty with breakage is experienced with irons of this type not only from handling and shipping but also from the thermal shock of the first application of heat. The addition of nickel materially toughens these irons so that this breakage is avoided.

The austenitic Ni-Resist cast iron provides unusually good growth-resistance due to the fact that it undergoes no transformation on heating and resists oxidation by virtue of its alloy content.

The compositions in the accompanying table are recommended for resistance to growth in oxidizing atmospheres at temperatures above the critical range.

In the Ni-Cr type of iron, a ratio of either 2 Ni : 1 Cr, or 3 Ni : 2 Cr, is preferable. It may be added that in the low-alloyed irons it is generally more satisfactory to keep the silicon content within the specified range than at less amounts. This tends to improve the machining qualities of the irons without seriously impairing their resistance to growth.

Resistance to scaling is provided by the Ni-Cr and Ni-Resist types of cast iron, suitable compositions of which are shown in the table.

In carbonaceous atmospheres, such as illuminating gas, growth is caused by the deposition of free carbon within the graphite passageways. Irons which appear to resist this kind of growth well are the Ni-Tensyl and Ni-Resist types. Compositions recommended for resistance to growth in carbonaceous atmospheres at temperatures above the critical range are given in an accompanying table.

In conclusion, it may be stated that all of the experimental data (with the exception of that on the automotive compositions) cited herein have been checked by duplicate tests, and the values obtained were in close agreement with those presented.

Applications

HEAT-RESISTANT nickel and nickel-chromium cast irons have found widespread use in locomotive, marine, stationary and internal-combustion engine construction.

A typical instance of the saving effected by the use of alloyed iron is demonstrated by experiences with grate bars. Alloyed iron grate bars containing 1.5 per cent Ni and 0.5 per cent Cr were substituted for the plain iron grate bars previously used in an enclosed type stationary boiler. The plain iron had lasted 12 weeks before burning out, whereas the Ni-Cr iron bars were still in use after 52 weeks of continuous service.

Other successful applications of nickel and nickel-chromium cast irons for growth resistance include stoker grate clips, stoker links, spreader plates on locomotive stokers, exhaust manifolds, permanent molds, anode molds, sugar refining char retorts, melting pots, stove parts, glass molds, die casting machine parts, steam valves, etc.

Ni-Resist cast iron has been widely adopted where heat-resistance is required at temperatures up to about 1500 deg. F. (815 deg. C.). In the ceramic industry Ni-Resist enamelware supports have lasted from six to seven months as compared with ten days for ordinary cast iron. Hot sections of glass annealing furnaces which operate at a temperature of 1100 to 1400 deg. F. (600 to 775 deg. C.) have been built in Ni-Resist, and this material outlasted plain cast iron at a ratio of about ten to one.

Among the many commercial applications of Ni-Resist for heat-resistance are butterfly valves in exhaust manifold, oil burner parts, oil and gas combustion chambers, heavy ranges and stove parts, coke and gas oven doors, cyanide pots, gas producer parts, sugar refining char retorts, piston rings for steam engines and gas engine compressors, glass molds other than "suction" molds, glass rolls, hot oil pumps, heat interchangers, etc.

The author wishes to express his thanks to P. D. Merica, J. S. Vanick and T. H. Wickenden for their guid-

Cast Irons Recommended for Use at Temperatures Above the Critical Range

Type of Iron	TC	Si	Ni	Cr	Cu
Ni-Cr	3.10-3.25	1.25-1.50	1.00-2.50	0.50-1.25	....
Ni	3.10-3.25	0.75-1.25	2.50-3.50	.....	....
Ni-Resist	2.90-3.10	1.25-1.50	14±	2.0-5.0	6±

Cast Irons Which Resist Growth in Carbonaceous Atmospheres at Elevated Temperatures

Type of Iron	TC	Si	Ni	Cr	Cu
Ni-Tensyl	2.60-2.80	1.50-1.75	1.25-1.75	.....	....
Ni-Resist	2.90-3.10	1.25-1.50	14±	2.0-5.0	6±

Fig. 12—Ni-Resist furnace parts after 33½ months' service in a continuous annealing furnace; very little growth or scaling occurred.

ance and criticism throughout the course of this work, and also to F. E. Kasch for assistance in the collection of the data.

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Fig. 13—At the extreme left is shown an untreated bar representing the original size (1 in. diameter and 12 in. long) of the bars to the right. The second bar from the left is Ni-Resist, followed by a 1.25 per cent Ni—0.50 per cent Cr iron and a plain iron, respectively. The bars were heated in an oxidizing atmosphere to 1600 deg. F. and cooled to room temperature 37 times.

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Hardening of Steel Gears

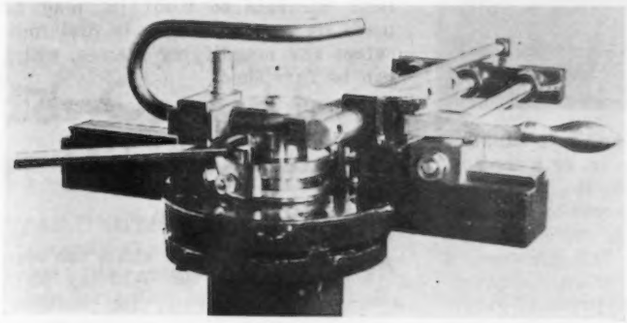
(*Concluded from Page 28*)

plode at this time is that the process of cyaniding makes noisy gears. Bad tooth form is the chief cause for noisy gears. It has often been assumed that cyanided gears had a higher pitched tone, but after observing one transmission model in production for three years with rejections not over 1 per cent, I can see no basis for the assumption that the operation of cyaniding has any influence on the acoustics of transmission gearing.

Since we have adopted the cyanide process not only has the wearing qualities of our gears improved but also the breakage has decreased. We have found that worn gears do not last long after the tooth form is destroyed by wear and pitting, and that such gears fail quickly from fatigue. If the involute pavement is maintained better gear life can be expected. It seems, therefore, that the slogan of the paint manufacturer also applies to gearing: "Save the Surface and You Save All."

Hand and Power Tube Benders Designed for Rapid Production

THE Schatz Mfg. Co., Poughkeepsie, N. Y., is offering the Climax tube bending machine illustrated in hand and motor-driven types and in various sizes with capacity up to 8 in. outside diameter for steel tubes and up to 10 in. outside diameter for non-ferrous tubes. The hand-operated bender here shown, the R-11, is designed for bending steel tubes up to 1 3/16 in. outside diameter and non-ferrous tubes up to 1 9/16 in. outside diameter.



Motor-driven as well as hand operated types are made for bending steel tubes up to 8 in. O. D. and non-ferrous tubes up to 10 in O. D.

The machine has a patented mandrel and machine release, and is said to make faultless bends cold without filling. Right and left-hand bends can be made. When the material is favorable, the machine can bend down to a radius of 1½ times the outside diameter of the tube measured to the center of the tube. Bends are made at the rate of 60 to 80 an hour.

All segments are arranged for bending up to 180 deg., and there is a graduated gage to assure accurate bending. The machines are said to have ample strength to bend S.A.E. 4130 steel tubes and annealed Allegheny metal tubes. The tools are finely finished to prevent marring of the work, thus reducing polishing costs. Special segments can be furnished for making bends that run into one another, such as in bicycle handle bars. The two largest motor-driven benders have two operating speeds, and accelerated return of the segment to the original bending position.

High Production Claimed for Wire Cutting Unit

THE wire cutting machine illustrated is intended primarily for cutting into various lengths welding wire of various gages and diameters. It was designed and built by the Sommer & Maca Glass Machinery Corpn., 3600 South Oakley Avenue, Chicago, in collaboration with C. H. Hollup, welding wire specialist.

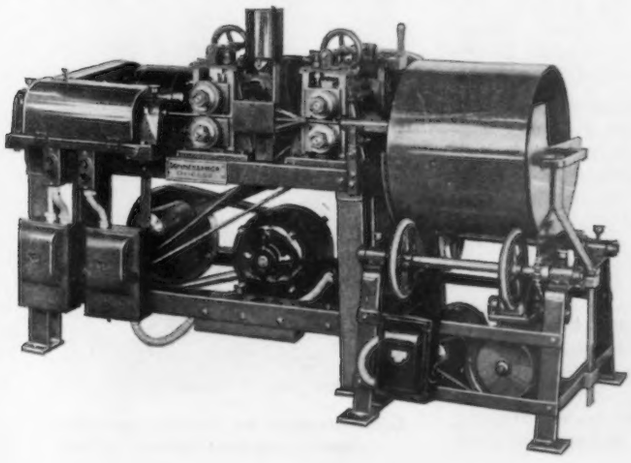
Although designed for the welding wire trade, the machine is said to be equally effective wherever cutting of wire in lengths ranging from 1½ in. up to several feet is desired. On welding wire the production is given as about 300 pieces, standard lengths, a minute; on short lengths of wire for other purposes production is said to be as high as 3600 pieces a minute. As the welding wire is being cut into lengths on this machine, there is also an arrangement whereby the wire receives a coating at the same time. This, it is pointed out, has heretofore been a separate operation.

The machine is entirely self-contained. Three motors, of 3, 2 and ½-hp., respectively, are employed; these transmit power to the drive shaft through V-belts. It is stated that the Sommer & Maca corporation is working in conjunction with the Electric Arc Cutting & Welding Co., whereby an arrangement may be made for the user of the machine to operate under a Holslag license for the processing of the wire as mentioned above.

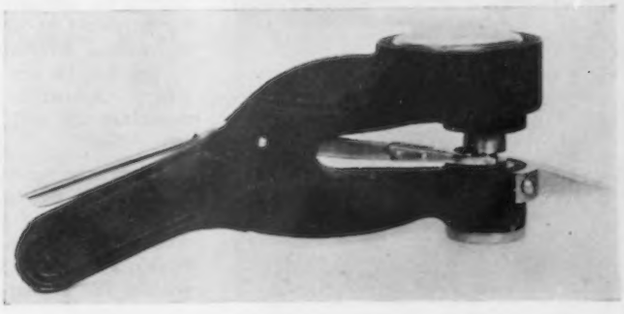
Thickness Gage Has Automatic Features

SOLID clamping of the material being gaged before the measuring anvils come in contact with the work is a feature of the new thickness gage brought out by the Federal Products Corpn., Providence, R. I. This arrangement, it is stated, eliminates the element of human touch and determines when the material being gaged is in proper alinement with the gaging points, which is always necessary in obtaining positive and accurate measurement.

The gage is made with two ¾-in. diameter alining surfaces; in the center of the lower one of these there is a stationary gaging point and in the upper one the point making direct contact with the dial indicator. Operation of the gage, designated as the model 644, is entirely automatic. It is only necessary to insert the work between the anvils, release the lever on the handle of the gage; the material then is clamped securely in alinement with the two indicating points and its thickness shown immediately on the dial indicator. The projecting triangular shoe under the lower anvil is simply a guide to facilitate locating the material between the anvils. The dial indicator is equipped with two tolerance hands which can be set for any limit desired; this eliminates the necessity for carefully reading the position of the hand on the dial each time a measurement is made.



THE wire cutting machine at left is designed primarily for cutting welding wire, which it also coats. In cutting welding wire, production is given as 300 pieces per min. Solid clamping of the material being gaged before the measuring anvils come in contact with the work is a feature of the thickness gage pictured below



Self-Contained Hydraulic Transmissions for Machine Drives

A LINE of standardized Hydro-Power units for application to various types of hydraulically-actuated machinery is being placed on the market by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio.

Each of these units incorporates an H-P-M radial pump pressure generator, direct driven from an electric motor through a flexible coupling. Pump and motor are mounted on a steel plate base, which is formed and welded. Entirely inclosed, this base serves also as a reservoir for the pressure and lubricating oil. It is equipped with removable end cover, covered filling strainer, air vent filter, level gage and drain valve. It is also fitted to take a copper coil for cooling water circulation when operating conditions require auxiliary oil temperature regulation.

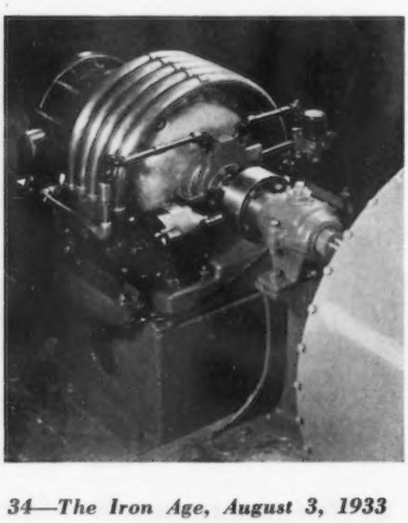
Pressure output of the radial pump is regulated by an automatic control which may be adjusted for any value up to 3000 lb. per sq. in. A modified form of this control is provided with a second adjustment whereby the volume of pump discharge may be regulated to any amount from zero to maximum.

This type of power unit provides a

single stage of high-pressure capacity up to 3000 lb. per sq. in. or a medium pressure up to 1500 lb., depending upon the radial pump employed. When initial work or closing movements are to be performed at low pressure, a two-stage Hydro-Power unit is recommended. This has two pressure-generating pumps, namely, a high or medium pressure radial pump, and a low pressure rotary pump to provide larger volume for the initial portion of the operation. When the low pressure limit is reached its output is by-passed at zero pressure by an automatic unloading valve.

Hydraulic Coupling for Centrifugal Pumps

LOWER operating costs are claimed for the hydraulic coupling announced recently by the American Blower Co., Detroit, for controlling and varying the speed of centrifugal pumps. It is stated that the coupling is designed for use with a simple induction motor to replace the slip ring motor in pump operation, and will eliminate the loss of power incurred where throttle valves are used. Because of the infinite number of speeds possible with this hydraulic device, the exact speed for any desired load may be obtained directly and without loss of power. The coupling is said to deliver 130 hp. at 3600 r.p.m.



Spring Testers Equipped With Length Scales

ELASTICOMETER pendulum indicating spring testing machines the weigher scale of which has been completely redesigned have been placed on the market by the Coats Machine Tool Co., 110 West Fortieth Street, New York. In general construction the new machines, designated as the DS, are the same as the type D testers described previously.

The drive and weigher scale are located in two cast iron housings, connected by tubular pillars which may be adjusted to accommodate springs of various lengths. Spring load and spring length are indicated automatically. Operation is simple, and the machines are well suited for quantity inspection.

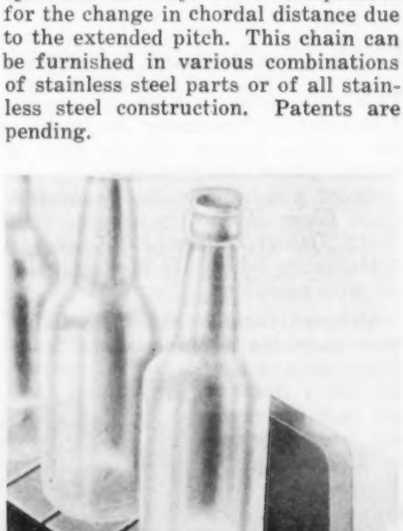
Load reading for any given length is obtained by turning a handwheel at the front of the base until the compression plates, or the tension hooks, as the case may be, are brought within the required distance of each other. This causes the pendulum of the machine to swing over an arc equipped with upper and lower scale graduated in pounds.

The corresponding length reading is obtained from a vertical scale, which is suspended as a separate unit from the upper compression plate. This scale is free to slide on the right-hand pillar through a vertical channel of the spring length index arm which extends from the lower compression plate to the right-hand pillar. An important feature is that length readings taken from this scale measure the distance between pressure plates (or tension hooks) independent of form changes of the machine. Length tests accurate to 0.001 in. may be made by means of built-in dial indicators and magnifying glasses, which can be furnished.

All-Steel Roller-Type Conveyor Chain

AN all-steel conveyor chain has been developed by the Whitney Mfg. Co., Hartford, Conn., for bottling, packaging and other machinery requiring a built-in conveyor chain.

All-steel construction is said to permit accurate manufacture, resulting in unusual smoothness of operation, strength, and resistance to wear. The pitch dimension is double the standard roller chain pitch which allows them to run on standard cut sprockets, the rolls meeting every other tooth. The outside dimensions of the smaller sprockets are adjusted to compensate for the change in chordal distance due to the extended pitch. This chain can be furnished in various combinations of stainless steel parts or of all stainless steel construction. Patents are pending.



Conveyor chain for bottling and other machinery requiring built-in conveyor

THE NEWS OF THIS WEEK

Bids Opened for 21 Naval Vessels

WASHINGTON, Aug. 1.—Approximately 45,450 tons of plates and shapes will be required for the 21 naval vessels for which bids from 12 shipbuilding companies were opened by the Bureau of Supplies and Accounts, Navy Department, last Wednesday. Requirements are estimated at 30,350 tons of plates and 15,100 tons of shapes. Sixteen of the ships are to be built from funds allocated under the authority of the National Recovery Act and five are to be built from funds from current naval appropriations. While the Navy Department is planning to make awards as soon as possible in order to get construction under way and labor employed, it was stated by the Department that bid prices in some instances were accompanied by conditions which might make them unacceptable. Some bids were made on both a fixed price basis and others made subject to adjustment on a definite basis for changes in labor and material costs. The order shortening the work week and raising wages in private shipyards apparently will make adjustments necessary and have complicated the bids.

Vessels for which bids were opened and estimated steel requirements were:

	Total Tonnage	Plates	Shapes
Two aircraft carriers..	18,000	12,000	6,000
*One heavy cruiser....	7,000	4,625	2,375
One light cruiser.....	7,000	4,625	2,375
15 destroyers.....	12,000	7,900	4,100
Two submarines.....	1,450	1,200	250

*By terms of London treaty this cruiser is not to be laid down before Jan. 1, 1934.

The Bethlehem Shipbuilding Corpn., Fore River, Mass., was the lowest bidder on the heavy cruiser and the New York Shipbuilding Co. was low on the light cruiser. The Newport News Shipbuilding & Dry Dock Co., Norfolk, Va., was low on the two aircraft carriers. The Sun Shipbuilding & Dry Dock Co., Chester, Pa., was low on one submarine, while the Electric Boat Co. was low on these vessels when based on bids for the two combined. Each yard submitted bids for one to four destroyers each. These bids carry numerous conditions and it is not possible to indicate definitely which yards are the lowest until careful study has been made. On the face of bids, however, it appears that among the low bidders for one to four destroyers are the Bethlehem Shipbuilding Corpn., the United Dry Docks, Inc., New York, and the Gulf Industries, Pensacola, Fla.

The entire naval program, including ships to be built under the National Recovery fund and current naval appropriations, consists of 37 ships, 21 to be constructed in private and 16 in navy yards. The ships to be built in the navy yards are three light cruisers, nine destroyers, two submarines, and two gunboats. Of these one gunboat has been allocated to the New York navy yard, one gunboat to the Charlestown navy yard, two submarines to the Portsmouth navy yard and two destroyers to the Boston navy yard. It is probable the other vessels will be allocated to the navy yards when awards to the private yards are made.

The 16 ships to be built in the navy yards will require about 31,250 tons of steel, consisting of 21,775 tons of plates and 9475 tons of shapes, as follows:

	Total Tonnage	Plates	Shapes
Three light cruisers...	21,000	13,875	7,125
Nine destroyers.....	7,200	5,400	1,800
Two submarines.....	1,450	1,200	250
Two gunboats.....	1,600	1,300	300

Chevrolet Buys Tools for 1934 Car

DETROIT, Aug. 1.—The Chevrolet Motor Co. has placed orders for the first few special machines with tool manufacturers in connection with its tooling up program for its 1934 car. Its tentative buying schedule is said to call for equipment expenditures of about $1,000,000, including a large amount of grinding and drilling machinery, wire coiling machines and heat-treating equipment.

Unless last-minute changes are made, Chevrolet's program as it stands forecasts a new front axle with independent spring suspension for the front wheels. It also is considered likely that motor changes will be sufficiently extensive to necessitate the purchase of considerable new machine tools for machining the cylinder block, crankshaft and camshaft. The program is now being held up until readjustments are made to conform to the industry's new code, the terms of which were agreed upon last week.

Machine tool builders and dealers here are figuring on a large volume of inquiries. Little of this is likely to be translated into orders until manufacturers know what their costs will be under the recovery plan. However, the outlook is bright for purchases of considerable proportions in the next 60 days.

Whitman & Barnes, Inc. Acquires 3 Subsidiaries

WHITMAN & BARNES, INC., manufacturer of twist drills, reamers, cutters, punches and other tools, established in 1854, with factories in Detroit and Walkerville, Ont., announces the acquisition of three subsidiaries, following consummation of a reorganization plan, ratified by the stockholders of the various companies, on July 21, as follows:

Latrobe Tool Mfg. Co., Latrobe, Pa., manufacturer of twist drills and

reamers, as well as machine knives for the woodworking industry.

J. M. Carpenter Tap & Die Co., Pawtucket, R. I., established 1870, the oldest manufacturer of taps, dies, screw plates, etc., in the Unites States.

Valley Forge Steel & Tool Co., Chicago, one of the largest tool distributing organizations in America, dealing chiefly in twist drills, reamers, taps, dies, etc.

Clarence Avildsen, newly elected chairman of the board of directors of Whitman & Barnes, Inc., stated that, in order to provide the maximum distribution of employment, in support of President Roosevelt's recovery campaign, no consolidation of the manufacturing and sales organizations of the four companies is contemplated. Rather, it is planned that each of the four companies shall carry on with its present staff of employees.

Mr. Avildsen has held the position of chairman of the Latrobe, Carpenter and Valley Forge companies for the last eighteen months. M. J. Kearins, Chicago, was elected president of Whitman & Barnes, Inc., succeeding William H. Eager, who has retired as an active officer, although remaining on the board of directors.

Earl F. Reinhart and Erik Andersen, both of Chicago, were elected vice-president and treasurer, respectively, succeeding Karl Kendig, who has retired as an active officer, although remaining on the board of directors. Mr. Reinhart has been vice-president of the Latrobe company for several years and Mr. Andersen has been, for a number of years, the treasurer of the Valley Forge company. Harry J. Cogswell, Chicago, will continue as president of the Valley Forge Steel & Tool Co.

The newly elected board of directors of Whitman & Barnes, Inc., is as follows: Clarence Avildsen, Chicago, chairman; Edward B. Burling, Washington; William H. Eager, Detroit; Harry C. Edmonds, Chicago; Joseph G. Hamblen, Jr., Detroit; Christian H. Hecker, Detroit; M. J. Kearins, Chicago; Karl Kendig, Akron, Ohio; I. B. Shallenberger, Latrobe, Pa.; George Alston Smith, Syracuse, N. Y., and Muir B. Snow, Detroit.

Cleveland Die and Tool Shops Organize

Jobbing machine shops, tool and die shops in Cleveland have effected an organization under the name of the Special Tool, Die and Machine Industries Association. Glen Barth, president, Barth Machine & Stamping Co., is president; O. C. Sabin, Sabin Machine Co., is vice-president; A. W. Hecker, president, Hecker Machine Tool Co., is secretary-treasurer and Lester E. Butzman, president Ohio Tool Co., is chairman of the code committee.

Bethlehem Steel Shows Operating Profit for Quarter

OPERATIONS of the Bethlehem Steel Corpn. for the second quarter of 1933 showed a profit, the first time since the last quarter of 1931. When allowance was made for depletion and depreciation, however, the quarter's showing was a deficit as indicated in the accompanying table. Current operations are at the rate of approximately 50 per cent of capacity, and President E. G. Grace said he expected the same average rate for August. The rapid improvement experienced by the company is told by the operating rates, as follows: April, 20 per cent; May, 29 per cent; June, 38 per cent, and July 50 per cent. The second quarter averaged 28.7 per cent as compared with 15.8 per cent for the previous quarter and 18 per cent for the second quarter of 1932.

Comparison of income and charges for the second quarter with those for the first quarter and the corresponding one of 1932 is as follows:

	Second Quarter 1933	First Quarter 1933	Second Quarter 1932
Total income.	$1,669,559	*$866,144	$271,174
Interest charges ...	1,662,550	1,658,381	1,706,129
Balance ...	$7,009	*$2,524,525	*$1,434,955
Depletion and depreciation	3,319,855	3,244,926	3,236,311
Net income	*$3,312,846	*$5,769,451	*$4,671,266

*Deficit.

Orders on hand June 30, 1933, $42,647,681, as compared with $38,360,601 at the end of the previous quarter and $28,724,004 on June 30, 1932.

Other Financial Statements

INLAND Steel Co., of Chicago, and its subsidiaries earned a profit during the second quarter of 1933, amounting to $25,760.74. A summary of the operating statement follows:

Net earnings after deducting administration expense and repair and maintenance charges...		$1,165,841.46
Deduct:		
Interest on bonds...	$465,750.00	
Depreciation and depletion	674,330.72	1,140,080.72
Net profits for quarter		$25,760.74

SHARON Steel Hoop Co., Sharon, Pa., shows a profit for the first half of 1933 before depreciation, as follows:

Gross profit from operations		$539,074.71
Less—Idle time expense.		130,400.43
Net profit after charges for maintenance and repairs		$408,674.28
Deduct:		
Interest and discount on bonds.....	$156,269.93	
Interest on notes payable, etc.....	34,075.29	190,345.22
Profit before provision for depreciation.....		$218,329.06
Depreciation of plants and equipment.....		475,755.34
Loss for the six months		$257,426.28

JONES & Laughlin Steel Corpn. and subsidiary companies report for the second quarter net loss of $1,682,801, compared with net loss of $2,060,645 in the preceding quarter and net loss of $2,110,851 in the June quarter of 1932. For six months, net loss was $3,743,446, compared with net loss of $4,509,940 in the first half of 1932. The operating loss in the second quarter of this year was only $384,206, contrasted with $805,384 in the first quarter.

WHEELING Steel Corpn. and subsidiary companies report for the quarter ended June 30 profit of $482,-143, after all charges. This compares with loss of $802,419 in the preceding quarter and loss of $686,324 in the second quarter of 1932. Net loss for the first half of 1933 was $320,275, compared with net loss of $1,509,460 in the first six months of 1932.

YOUNGSTOWN Sheet & Tube Co. in the second quarter sustained net loss of $2,207,592, compared with net loss of $3,473,370 in the first quarter and net loss of $3,288,861 in the second quarter last year.

TIMKEN Roller Bearing Co. and subsidiary companies report for the second quarter net profit of $929,460, after depreciation, Federal taxes, etc., equal to 38c. a share on common stock, compared with net loss of $276,066 in the first quarter and net profit of $199,903, equal to 8c. a share in the second quarter of 1932.

WESTINGHOUSE Electric & Mfg. Co. reports for the second quarter net loss of $2,078,424, compared with net loss of $3,491,572 in the first quarter and net loss of $1,881,979 in the second quarter last year. The company showed net income of $14,138 for June.

ALLIS-CHALMERS Mfg. Co., Milwaukee, reports for the six months ended June 30 net loss of $1,658,907 after depreciation, interest and taxes, compared with $1,805,892 in the corresponding 1932 period. Unfilled orders as of June 30 totaled $4,-830,996, compared with $4,470,399 on March 31 and $7,136,087 on June 30.

REPUBLIC Steel Corpn. reports a loss of $407,451 during the second quarter of 1933, after deducting maintenance and repairs, interest, depreciation for renewal of plants and for exhaustion of minerals, and preferred dividends of the Trumbull-Cliffs Furnace Co. This is a marked improvement over the first quarter when the loss was $2,521,568 and compares with a loss of $2,744,826 during the second quarter in 1932.

British Tin Plate Activity Tapering

LONDON, ENGLAND, Aug. 1 (*By Cable*).—It now appears that the Continental Steel Cartel has not officially reduced merchant steel bars for the United Kingdom to £2 15s., gold, f.o.b., but certain Belgian works are permitted to accept this figure to replenish order books. Plates have been sold to the United Kingdom at £3 10s., gold, f.o.b. German works are not prepared to accept any orders below the official rates.

The Hoop Cartel has raised prices by 2s. 6d., gold, per metric ton.

The Raw Steel Cartel has fixed the export quota for the June-September period at 500,000 metric tons monthly but may raise it before Oct. 1.

The British pig iron market is fairly active with a sustained home demand, despite the holidays; export sales have been increasing, with Scandinavia a notable buyer of British iron.

British makers of heavy steel have reaffirmed prices. Plate mills need orders but structural and railroad steel is moving more freely.

Tin plate is dull, and, with certain works in need of specifications, prices are depressed; consumers are holding off in hopes of obtaining still further concessions. Output has recently been over 70 per cent of capacity but is expected to fall after the August holiday week.

There is a good demand for Continental semi-finished steel by United Kingdom consumers. The cartel's official gold, f.o.b., prices for billets and sheet bars remain unchanged but actual bookings have been done at best delivered prices obtainable.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9		
Billets, open-hearth	£5	to	£5 7s. 6d.
Black sheets, Japanese specifications	£11		
Tin plate, per base box	16s. 9d.	to	17s. 3d.
Steel bars, open-hearth	£7 17½s.	to	£8 7½s.
Beams, open-hrth.	£7 7½s.	to	£7 17½s.
Channels, open-hearth	£7 12½s.	to	£8 2½s.
Angles, open-hearth	£7 7½s.	to	£7 17½s.
Black sheets, No. 24 gage	£9		
Galvanized sheets, No. 24 gage	£11	to	£11 10s.

Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £ at $4.86

*Ingots	£2 5s.		
*Billets, Thomas	£2 7s.		
Wire rods, No. 5 B.W.G.	£4 10s.		
Black sheets, No. 31 gage, Japanese	£11 5s.		
*Steel bars, merchant	£3		
*Sheet bars	£2 8s.		
Plates, ¼ in. and up	£3 18s.	6d.	
*Plates, 5/16 in. and 5 mm.	£4 1s.		
*Sheets, ⅛ in.	£4 6s.		
*Ship plates	£4 10s.		
*Beams, Thomas	£2 16s.	6d.	
*Angles (basis)	£3		
Hoops and strip steel over 6-in. base	£3 15s.		
Wire, plain, No. 8	£5 7s.	6d.	
Wire nails	£5 15s.		
Wire, barbed, 4-pt. No. 10 B.W.G.	£8 15s.		

*Prices as established by European Raw Steel Cartel.

Stevens Institute to Hold Third Economic Conference

STEVENS Institute of Technology announces its third annual economic conference for engineers, to be held at the Stevens engineering camp, Johnsonburg, N. J., Aug. 12 to 20.

The general theme of the conference will be the financial situation. Among the speakers and topics are:

Prof. Frank W. Fetter, Princeton University—"European Currencies Since the Beginning of the World War."

Dr. H. S. Person, Managing Director of the Taylor Society—"Future Supply of Capital for Commerce and Industry."

Prof. Walter Rautenstrauch, Columbia University—"The Fundamentals of Our Industrial Economy."

Colonel Willard T. Chevalier, *Engineering News-Record* — "Public Construction and Public Finance."

Prof. Alzada Comstock, Mount Holyoke College—"Present-Day Problems of Taxation. Sales Taxes: For and Against."

James H. R. Cromwell, Author and Economist — "Constitution vs. Parliamentary Government."

Earl Sparling, New York *World-Telegram*—"A Newspaper Man Looks at Economics."

Donald B. Woodward, Edie-Davidson, Inc.—"Inflation."

Fred I. Kent, Federal Reserve Foreign Exchange Adviser — "The International Financial Situation."

Machinery Institute Elects Officers

COMPLETE organization of the Machinery and Allied Products Institute, founded recently to represent machinery companies of the country, with their 350,000 employees and their $3,500,000,000 capital investment, under the new Industrial Recovery Act, has been announced with the election of officers and the opening of national headquarters at 221 North LaSalle Street, Chicago.

In addition to John W. O'Leary, Chicago manufacturer, whose election to the presidency was reported a few weeks ago, the other national officers are Harry C. Beaver, Worthington Pump & Machinery Corpn., New York, vice president; Paul C. DeWolf, Brown & Sharpe Mfg. Co., Providence, R. I., secretary; and Col. Robert H. Morse, Fairbanks, Morse & Co., Chicago, treasurer.

Mr. O'Leary has implied that the machinery code will present many departures from old practices. "Our biggest task right now is to cement the industry together on a mutual working basis that will offer a happy medium between those who have carried the former practice of individualism to extremes and that exactly opposite group who can see nothing but regimentation," he said. "To make the most of the new tempo, we must adjust all of our membership to the new concept of business as it undoubtedly will be conducted in the United States for some years to come."

Code Council Formed for Secondary Materials

A NATIONAL Council for the secondary raw materials industry, comprising scrap iron, scrap metals, woolen rags, wiping cloths, used burlap bags, waste paper and cotton waste, has been organized. Following are the temporary officers:

Ivan Reitler, American Smelting & Refining Co., New York, chairman; Herman D. Moskowitz, Schiavone-Bonomo Corpn., New York, vice-chairman; Benjamin Schwartz, director general of the Institute of Scrap Iron and Steel, New York, trade relations counsel.

The National Council, which will be permanently organized at a meeting scheduled for Aug. 1 and attended by official representatives of the ratifying trade associations, will serve in an advisory capacity during the national emergency declared by the National Recovery Act. Its first duty will be to assist the various branches of the industry in preparing their codes of fair competition. It was estimated at the meeting that the secondary raw materials industry normally employs over 250,000 persons.

The following trade associations were represented at the meeting: Institute of Scrap Iron and Steel, National Association of Waste Material Dealers, Wool Stock Council, Sanitary Institute of America, National Burlap Bag Dealers Association, Non-Ferrous Ingot Institute, Aluminum Research Institute, Secondary Zinc Smelters Association and Empire Metal Merchants Association.

PERSONALS

RALPH H. WATSON, vice-president in charge of operations, Carnegie Steel Co., Pittsburgh, since Sept. 1, 1930, has been appointed vice-president in charge of operations of manufacturing interests of the United States Steel Corpn., with headquarters at 71 Broadway, New York. He joined the Carnegie Steel Co. in March, 1902, as a metallurgist's assistant at the Homestead Steel works. He successively became metallurgist, second assistant general superintendent, superintendent of open-hearth furnaces, assistant general superintendent, and in April, 1928, was made general superintendent of Homestead works, to succeed JOHN S. OURSLER, who at that time was made vice-president of the company. Mr. Watson was born in New Brunswick, Canada, in 1878, but later moved to Massachusetts, where he was graduated from the Lawrence Scientific School of Harvard University. His first experience was gained in the Bessemer department of the old Maryland Steel Co., at Sparrows Point, Md.

R. H. WATSON

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GEORGE E. JOHNSON, Beloit, Wis., associated for many years in executive capacities with Fairbanks, Morse & Co., on Aug. 1 assumed new duties with the A. O. Smith Corpn., Milwaukee. His work will be in connection with the office of W. C. HEATH, vice-president and general manager, and formerly vice-president of Fairbanks, Morse & Co., in charge of all manufacturing. Mr. Johnson was general manager of the Fairbanks-Morse plant at Three Rivers, Mich., having been transferred to the Beloit works as assistant to Mr. Heath in 1931.

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O. R. HENSCHEL, president, and R. O. ROOSEN, chief engineer, Henschel & Son, Cassel, Germany, manufacturer of locomotives, motor trucks, buses and aircraft, spent the past week in Milwaukee inspecting local manufacturing plants.

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CLOYD M. CHAPMAN, consulting engineer, has moved to new offices at 216 East Forty-fifth Street, New York.

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THOMAS R. MULLEN, formerly vice-president in charge of sales of the Lehigh Structural Steel Co., Allentown, Pa., has been elected general manager and treasurer, succeeding the late Robert Leslie Kift. MRS. ETHEL HARRISON KIFT has been elected vice-president, and WILLIAM H. MOHR, formerly vice-president in charge of plant operation, has been elected secretary and plant manager.

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E. R. KYLER, heretofore president of the Witt-Humphrey Steel Co., Greensburg, Pa., has been appointed president of the Kittoe Boiler & Tank Co., Canton, Ohio.

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J. HARRY PETTY has been made assistant manager of hardware, welding wire and cold drawn steel sales for David H. Smith & Sons, Inc., Brooklyn, N. Y.

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JAMES E. LOSE, general superintendent Homestead Steel Works, Carnegie Steel Co., Pittsburgh, has been made vice-president in charge of operations for the Carnegie company, succeeding RALPH H. WATSON. MALCOLM F. MCCONNELL, who has been general superintendent at the Mingo, Ohio, works of the Carnegie company, has been named to succeed Mr. Lose at Homestead. ROBERT S. QUINN has been made general superintendent of Mingo works, and HUGH B. CONOVER, assistant general superintendent.

A. J. JOHNSTON, whose election to the presidency of Hickman, Williams & Co. was announced in these columns last week.

W. C. REILLY, vice-president, Youngstown Sheet & Tube Co., has retired from the operating department to become associated with the president's office in charge of development and general research. He has been connected with the company for about 33 years, having been associated with the former president, JAMES A. CAMPBELL, during the company's early years and was in charge of constructing and operating the company's first plant. W. B. GILLIES, assistant vice-president of the company, for the past four years, succeeds Mr. Reilly as vice-president in charge of operations. Mr. Gillies' affiliation with the company began in 1923, when it purchased the Steel & Tube Co. of America, with which he was formerly associated. JOSEPH B. SUGDEN, formerly cashier of the company, has been appointed assistant treasurer, and ARTHUR PURNELL, sales manager in the Chicago district, has been made assistant treasurer in conjunction with his office at Chicago. JOHN H. HALL, formerly tax accountant, has been appointed general auditor, and JOHN H. STEEVES has been made works auditor.

W. B. GILLIES

Milwaukee metal trades employment in June increased sharply for the third consecutive time to the highest point in more than a year. Total number of employees in 39 shops reporting to the local branch of the National Metal Trades Association was 9399, compared with 8401 recorded in 38 shops for May, an increase of 998. In June, 1932, when 44 shops reported, the number at work aggregated 8850.

The mechanical department of the Indiana Harbor Works, East Chicago, Ind., of the Youngstown Sheet & Tube Co., has established an unusual record by operating three years without a loss-of-time accident. With 312 men employed in the department, a total of 2,276,249 hr. were worked without a single loss-of-time accident.

Daily Pig Iron Production Gained 39 Per Cent in July

ESTIMATED production of coke pig iron in July totaled 1,819,438 gross tons against 1,265,007 tons in June. The July daily rate, at 58,692 tons, increased 39 per cent over the June average of 42,166 tons a day. The daily rate in July was the highest since May, 1931, which was 64,325 tons.

There were 106 furnaces in blast on Aug. 1, compared with 90 on July 1. Sixteen furnaces were blown in and none blown out during the month.

(The usual tabulations will appear next week.)

Canadian Iron and Steel Production in June

PRODUCTION of pig iron in Canada amounted to 857 gross tons in June. This was the first pig iron made in Canada since Feb. 14. The two active furnaces had a daily capacity of 900 tons, one 350-ton furnace going into blast at Port Colborne, Ont., on June 26, and one 550-ton furnace being blown in at Sydney, N. S., on June 28.

Output of ferroalloys in Canada during June at 910 tons represented a decline of 12 per cent from the 1030 tons of May. For the six months ending June production totaled 6078 tons as compared with 8759 tons made during the corresponding period of a year ago. This half-year's output was largely made up of spiegeleisen, the balance being ferrosilicon.

Production of steel ingots and direct steel castings in Canada at 31,602 tons in June was the second best monthly total reported for the year to date, being only exceeded by the 40,766 tons of January, and represented an increase of 37 per cent over the 23,126 tons of May. The June figures included 30,576 tons of steel ingots made for the further use of the producers and 1026 tons of steel castings, most of which were made for sale.

For the first six months of this year the output of primary steel totaled 130,464 tons as compared with 180,488 tons and 461,877 tons produced the first half of 1932 and 1931, respectively.

Although no price increases were recorded in iron and steel products, some improvement in the industry was noted. Orders continued to be mostly for small spot tonnages but indications pointed to higher operating schedules. The Dominion Bureau of Statistics index number of wholesale prices of "Iron and Its Products" moved down from 84.5 in May to 84.2 in June. This decline was due mainly to lower prices for foundry pig iron, and for hot rolled and annealed steel sheets. No. 1 foundry pig iron fell from $23 in May to $22 per gross ton, delivered at Montreal, and from $21.50 to $20.50 delivered at Toronto. No. 2 foundry pig iron moved down $1 to $22 and $20 per ton delivered at these respective centers.

Sales of Babbitt Metal in June

WASHINGTON, Aug. 1.—Sales of Babbitt metal in June totaled 1,877,731 lb., compared with 1,785,856 lb. in May, according to reports received by the Bureau of the Census from 39 manufacturers. In the first six months of 1933 sales were 7,867,643 lb. against 6,478,826 lb. in the corresponding period of last year. Production in June totaled 2,327,843 lb., compared with 2,110,621 lb. in May; in the first six months of the current year it totaled 9,641,384 lb. against 9,000,703 lb. in the first six months of 1932.

Employment and Hours Increased in June

THE returns received monthly by the National Industrial Conference Board from manufacturing establishments recorded for June, 1933, a notable advance over the previous month in employment and earnings of industrial workers. Employment in these factories increased 7.2 per cent. If this rate prevailed in all manufacturing industry the 6,139,000 workers computed to be occupied in May, 1933, were reinforced in June by about 442,000 additional workers. Hours of work for old and new workers increased 10 per cent from May to June. With practically the same hourly earnings in the two months, the weekly pay envelope contained 10 per cent more in June than it did in May. What this combination of more workers and longer hours meant to the community is seen in an increase of 18 per cent in man-hours and therefore in payrolls and purchasing power.

In June, 1933, the average weekly earnings, for an average week of 41.2 hours, were $18.49 for skilled and unskilled workers of both sexes. This figure is still 31.5 per cent below the level of money earnings in 1923. If account is taken of the fact that the cost of living, despite a slight rise in June over the May figure, is still far below the 1926 level, it appears that the June, 1933, pay envelope would buy almost as much as did that of 1923. In other words the purchasing power of wages in June, 1933, was 95.5 per cent of that of the year 1923.

The improvement noted was general among the 25 industries reporting to the Conference Board. With exception of four industries there was an advance both in employment and in hours.

New Departure Wages Up

HOURLY wage rates and salaries of $1,800 or less per annum were increased 10 per cent on Aug. 1 by the New Departure Mfg. Co. Frederick G. Hughes, general manager of the company, explains that the Aug. 1 increase is in addition to a 5 per cent increase which went into effect June 12 and restores wage rates substantially to the pre-depression level. The present increase affects 3750 employees now working at the Bristol and Meriden (Conn.) plants, of whom 2000 have been reemployed since April 1. It is the policy of the company to take on only residents of the cities in which the plants are located.

To Find If Barnacles Will Shun Stainless Steel

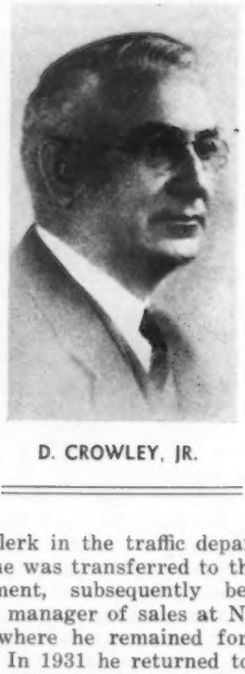
THE most recent attempt to provide a barnacle-resistant material for use in the construction of ships' keels is reported in an announcement from London that a well-known British stainless steel would be tested to determine its quality to resist adherence of barnacles, according to a report to the Commerce Department's Iron and Steel Division from London.

The steel to be tested is manufactured with 18 per cent chromium and 8 per cent nickel. One-third of the sheet to be tested will be left in a hot rolled condition, part painted with ship paint with the remaining portion of the sheet left in a bright, smooth condition, and immersed for a period of three months off Southland pier, London, where the water is infested with barnacles.

Engineers in charge of the test are of the opinion that barnacles will not attach themselves to the smooth portion of the sheet.

OBITUARY

DENNIS CROWLEY, JR., Pittsburgh district sales manager for Carnegie Steel Co., died suddenly at his home in that city on July 26. He was born in Ireland in 1877, and at an early age came to Pittsburgh, where he attended school. His first job was in the commercial agent's office of the Southern Pacific Railroad at Pittsburgh in 1894, and in 1901 he joined the Carnegie company as rate and



D. CROWLEY, JR.

route clerk in the traffic department. Later he was transferred to the sales department, subsequently becoming district manager of sales at New Orleans, where he remained for many years. In 1931 he returned to Pittsburgh as district sales manager. He was a member of the American Iron and Steel Institute and the Army Ordnance Association.

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MAX SEFFREN, veteran scrap iron and steel merchant and president of the Max Seffren Supply Co., Chicago, died on July 24. He was 70 years old and had been active in business until a few days before his death. He had been in business in Chicago for nearly 50 years.

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H. L. FLATHER, president and treasurer of the Flather Co., Nashua, N. H., died on July 7, aged 59 years. He entered the employ of Flather & Co. in 1890. Ten years later he became superintendent and treasurer, and when the company was reorganized in 1923 and the name was changed to the Flather Co., he became president and treasurer. He became associated with the Hurlbut, Rogers Machinery Co. in 1915 as treasurer. Mr. Flather developed many improvements in lathe design and held several patents, most noteworthy of which are in connection with change gear mechanism, taper and relieving attachments and a flange-type spindle nose. He was a director and past vice-president of the National Machine Tool Builders' Association, of which his father, the late Joseph Flather, was the first president.

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ARTHUR LORENZO MOORE, founder of the Springfield Drop Forging Co., Springfield, Mass., which was later reorganized as the Moore Drop Forging Co., died at his home in Huntington, Mass., on July 23. Mr. Moore was born in Worcester, Dec. 13, 1854. To him is attributed the first dies and forgings made in this country for bicycle manufacture. He retired from business in 1914.

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GEORGE E. GOODING, formerly vice-president of John R. Roberts & Co., Hyde Park district, Boston, machinery manufacturers, died on July 19, at his home in Saugus, Mass., following an illness of several months. He was born in Somerville, Mass., 82 years ago. He retired last December.

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THOMAS A. SOULTS, formerly general manager of the Marshall Furnace Co., Rochester, N. Y., died in that city on July 19, aged 64 years. Prior to his connection with the Marshall company, he was general superintendent of the Sterling Range & Furnace Co.

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JOHN D. DWIGHT, Washington Wis., for many years prominent in manufacturing in the Middle West, died at his summer home at Tawas Beach, Mich., July 23, aged 65 years. He went to Racine, Wis., from Evanston, Ill., in 1912 to become an executive of the Mitchell Magon Co. and Ajax Rubber Co., later taking over the management of the Belle City Malleable Iron Co., and then becoming assistant to the manager, General Motors Corpn., malleable division at Saginaw, Mich., rising to general manager. He retired about five years ago.

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FRANK W. PEEK, chief engineer of the Pittsfield, Mass., plant of the General Electric Co. and one of the company's specialists on high-voltage work, was killed when his automobile was struck by a train at Gascones, Que., on July 26. Mr. Peek joined the General Electric Co., in 1905 and did special tests until 1909, when he began research work under the late Dr. Charles Steinmetz. He was born in Mokelumne Hill, Cal., 52 years ago and was graduated from Leland Stanford University in 1905.

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CHARLES PFEIFFER, pioneer Milwaukee industrialist, died at Beverly Hills, Cal., July 22, aged 75 years. He was born in Watertown, N. Y., going to Milwaukee early in life. After learning the machinist's trade, he organized Pfeiffer & Smith Co. in 1890, in association with the late George H. Smith, and developed one of the largest machine shops in the Northwest. In 1898 Mr. Pfeiffer assisted Mr. Smith in organizing the George H. Smith Steel Casting Co., one of the first steel foundries west of Pittsburgh. He disposed of his Milwaukee business interests in 1916 and retired.

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ROBERT R. RUST, formerly president of the Central Foundry Co., died in New York on July 23. He received his technical training at the Armour Institute, Chicago. He became identified in 1903 with the New Jersey Zinc Co. as chemical and mechanical engineer and remained with the company until 1910, when he joined the Central company. Mr. Rust relinquished his commercial interests in 1921 to head the Heckscher Foundation for Children.

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CHARLES E. FINKL, for about 40 years general manager of A. Finkl & Sons Co., Chicago, died July 29, aged 60 years. He was a native of Chicago and had devoted his entire business life to the forging industry.

Increase of Employment by Limiting Hours

LIMITING the week's work to 35 hr. in manufacturing industry and 40 hr. in non-manufacturing pursuits would have required in May, 1933, about 1,681,000 more workers than the 12,185,000 estimated to have been employed. This is the conclusion of a computation of the National Industrial Conference Board. There is abundant evidence, the board adds, that total man-hours, particularly in manufacturing industry, were considerably more numerous in June than in May, 1933. If June work had been redistributed by the suggested limitation of hours it would have required an even greater number of additional workers, probably in the neighborhood of 2,000,000.

Malleable Orders Rose in June

WASHINGTON, Aug. 1.—Orders for malleable castings in June rose to 31,997 tons from 24,671 tons in May, according to reports received by the Bureau of the Census from 112 establishments. In the first six months of the present year orders were 109,213 tons compared with 109,854 tons in the corresponding period of last year. Production in June was 31,118 tons compared with 24,628 tons in May. In the first six months 1933 the output was 110,689 tons compared with 105,153 tons in the first half of last year.

Coal Strike Spreads in Connellsville Region

PITTSBURGH, Aug. 1.—Recognition of the United Mine Workers of America is now the admitted issue in the coal miners strike in southwestern Pennsylvania which has led to a declaration of martial law in Fayette County and to the sending of a detachment of the Pennsylvania National Guard to Brownsville, Pa., by Governor Pinchot. Rapid spread of the strike into nearby counties, including Allegheny, Westmoreland, Green and Washington, has focused nation-wide attention on the situation which seems to have arisen entirely as a result of the labor provisions of the National Industrial Recovery Act. The large steel companies operating in the district, together with the Pittsburgh Coal Co., have refused recognition of the union, although company unions have been established generally and wages in the mines and coke ovens have generally been raised above the levels demanded by the United Mine Workers.

Beginning last week in the mines of the H. C. Frick Coke Co., subsidiary of the United States Steel Corpn., and the Vesta Coal Co., subsidiary of the Jones & Laughlin Steel Corpn., the strike has now spread to the mines of the Republic Steel Corpn., the Youngstown Sheet & Tube Co., Pickands, Mather & Co., and the Pittsburgh Coal Co. Thomas Moses, president of the Frick company, has clarified the position of the operators in the following statement:

"The Frick company has for years operated as an open shop company. Recently we organized plant representation by our employees to conform to the terms of the National Recovery Act. We want to obey the law. We do not sell coal in the open market and we do not believe our operation comes under the terms of the code submitted last week by other operators. We do not plan to submit a code but to abide by the recovery act. The strike is intended to win recognition for the United Mine Workers with which we have refused to negotiate."

Union officials maintain that efforts were made to postpone the strike until after hearings on the coal industry's proposed code, but that miners were finally driven from the mines by a "campaign of persecution." Certain grievances have also been cited, the principal one being a desire for check weighmen at the mines. Nevertheless, no denial of the fact that recognition of the union is the principal issue has been made.

The immediate effects of the strike upon the steel industry have thus far been noticed only in a growing scarcity of furnace coke. The market is virtually without offerings today and blast furnace operators and steel companies who have been in the market recently have been unable to buy. The fact that many batteries of by-product ovens in the district were allowed to cool during the last two years and are just now being brought back into service has intensified the coke shortage with some of the independent steel companies. The Steel Corporation as well as the Jones & Laughlin company are reported to have large supplies of coal above ground as well as sufficient coke on hand to last for several weeks.

Last Minute Sales Leads

(Received too late for classification in our Plant Expansion Section)

Bavarian Brewing Co., Covington, Ky., has plans for extensions and improvements, including new mechanical bottling works. About $339,600 will be expended for new machinery for brew-house, storage and distribution, and other departments. New bottling plant will cost about $46,000 in addition to sum noted. Company has recently arranged financing totaling over $868,000, part of fund to be used for work. Carl J. Kiefer, Schmidt Building, Cincinnati, is consulting engineer.

Phelps Dodge Copper Products Corpn., 40 Wall Street, New York, has let general contract to Wigton-Abbott Corpn., 143 Liberty Street, for addition to plant at Elizabeth, N. J., consisting of two main one-story units, 130 x 390 ft., and 42 x 158 ft., with connecting structure, 100 x 200 ft. Cost about $200,000 with machinery.

Quartermaster, Marine Corps, Washington, asks bids until Aug. 8 for combination wire and sleeve clamps, wood boring bits, electricians' saws with extra blades, soldering irons, wire grips, etc. (Schedule 62).

Wisconsin Valley Improvement Co., Wausau, Wis., Harold L. Geisse, secretary, and Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis., jointly, have secured authority from State Assembly for new hydroelectric power and water storage projects on Big and Little Eau Pleine and Wisconsin Rivers. Hydroelectric generating station will be located on latter stream, near Knowlton, and will cost about $1,645,000, with power dam, transmission lines, power substations and other structures. Entire project will cost about $5,000,000.

John Deere Plow Works, Inc., Moline, Ill., manufacturer of plows, harrows and other agricultural implements, has acquired property, 150 x 325 ft., Los Angeles, as site for new plant. Cost over $100,000 with equipment.

Tower Builders, Inc., Los Angeles, has been organized as joint interest of Blaw-Knox Co., Blawnox, Pittsburgh; Western Pipe & Steel Co., and Consolidated Steel Corpn., Ltd., both Los Angeles, to carry out contract, totaling close to $3,000,000, recently secured from Bureau of Power and Light, Los Angeles, for fabrication of steel towers for electric transmission line from Government hydroelectric power project, Boulder Dam, Nev., to city.

Superintendent of Lighthouses, Staten Island, N. Y., asks bids until Aug. 10 for five lighted steel whistle buoys, three lighted gong buoys, six lighted bell buoys, and 12 steel light buoys (Proposal 44272).

Riverside Brewing Co., Riverside, Ont., has been acquired at public sale for $121,000 by new interests, headed by Gustave J. Maertens, president and treasurer, Ajax Bolt & Screw Co., 6623 Gratiot Street, Detroit, and associates. New company will be formed, with Mr. Maertens as president, to operate plant. Plans are under way for extensions and improvement, to include additional equipment. Cost over $85,000.

National Drawn Steel Co. plant, East Liverpool, Ohio, will be offered at a sheriff's sale, Aug. 11, including land, buildings and other property. Minimum figure of $50,000 has been set.

Department of Supplies and Purchases, City Hall Annex, Philadelphia, asks bids until Aug. 7 for castings, required to Dec. 31, 1933, inclusive (Class V-1).

Aluminum Specialty Co., Manitowoc, Wis., manufacturer of small aluminum ware, has acquired business and equipment of Metal Goods Corpn., St. Louis, and will consolidate operations at Manitowoc. Purchasing company also operates a plant at Chilton, Wis.

Union Oil Co., Mills Building, San Francisco, will soon begin erection of addition to plant at Oleum, Cal., primarily for lubricating oil production, including storage and distributing division. Cost over $600,000 with equipment.

Refrigerated Steamship Line, Inc., Jacksonville, Fla., a subsidiary of United Fruit Co., Pier No. 3, North River, New York, is planning erection of new precooling and refrigerating plant at Pier No. 1, Municipal Docks. Cost over $200,000 with machinery.

Premier-Pabst Corpn., West Juneau Avenue, Milwaukee, has authorized expansion program at branch brewery at Peoria Heights, Peoria, Ill., including additions and installation of brew-house, bottling and other equipment. Cost over $100,000 with machinery.

Lion Oil Co., El Dorado, Ark., plans rebuilding a portion of local oil refinery, including No. 2 battery of stills, recently damaged by fire. Loss about $50,000 with equipment.

Columbia Brewing Co., Columbia, Mo., has plans for new multi-unit plant, with boiler house, machine shop and other structures. Cost over $175,000 with equipment.

City Ice & Fuel Co., 6611 Euclid Avenue, Cleveland, plans new brewery at Miami, Fla., adjoining present ice-manufacturing plant, comprising multi-story unit and smaller structures. Cost $400,000 with machinery.

Goodyear Tire & Rubber Co., Akron, Ohio, will build a $740,000 power plant. Babcock & Wilcox Co. will supply a boiler and the General Electric Co. a turbine. Ash handling and other equipment will be installed.

Wisconsin Cooperative Brewery, Inc., room 847, 710 North Plankinton Avenue, Milwaukee, has plans by Ray C. Dieterich, architect, 647 West Virginia Street, for $250,000 brewery and malt plant, first unit, 80 x 180 ft., four stories, costing $100,000, to be erected immediately. Bottling house will cost $40,000 and malt house $50,000. G. L. Kraatz is general superintendent.

G. Heileman Brewing Co., 1018 South Third Street, LaCrosse, Wis., will remodel brewery, build new brewhouse with new filters, pumps, refrigerating plant, cooling equipment and two new 300-hp. boilers with automatic stokers, at cost of $165,000. R. A. Albrecht is general manager.

Structural Bookings For Second Quarter

BOOKINGS of structural steel for fabrication increased in June approximately 95 per cent over the bookings of May, according to American Institute of Steel Construction. The average bookings during the second quarter, however, were below those of the first quarter. The shipments during the second quarter were approximately 15 per cent above the shipments during the first quarter of this year but the average of the shipments during the first half of the year were about 8 per cent below the shipments during the same period of 1932.

Automobile Code Provides for 35-hr. Week

DETROIT, Aug. 1.—General Hugh Johnson last Thursday met here with the directors of the National Automobile Chamber of Commerce to complete the code for the automobile industry. It is understood assurance was given to the automobile builders that the Washington Administration would not become a party to the attempt of organized labor to unionize the industry.

The code calls for a 35-hr. week and a minimum wage ranging from 40c. to 43c. an hour for men employees; women are to be paid 5c. an hour less.

Section 6 of the code states that "the employers in the automobile industry propose to continue the open-shop policy heretofore followed and under which unusually satisfactory and harmonious relations with employees have been maintained. The selection, retention and advancement of employees will be on the basis of individual merit without regard to their affiliation or nonaffiliation with any labor or other organization." Thus the industry is left unhampered to manage its relationship with its own employees rather than having this relationship managed by outside forces.

The code committee of the N.A.C.C. wrestled with the formation of a code for weeks, but the collective bargaining feature proved the stumbling block which delayed agreement. The important companies, which always have insisted upon an open-shop labor policy, remained adamant in their demand that they not be compelled to deal with hastily formed labor unions sponsored by the American Federation of Labor in its present drive to unionize Detroit. In fact, it is believed that the personal assurance of General Johnson that they were not to be driven into such an arrangement was the only way in which the Washington Administration could secure voluntary agreement to a code.

It is believed that the meeting between the N.A.C.C. directors and General Johnson was a give-and-take affair and that in return for assurance from the latter that the present labor set-up in the automobile industry would be undisturbed, the automobile executives agreed to a shorter number of hours than they had intended to propose. The Chevrolet Motor Co., for example, has just finished the task of setting up its operations on the basis of a 37½-hr. week. It is reasonable to assume that it would not have done that had a shorter week been a strong possibility.

During his stay in Detroit, General Johnson made the following statement pertaining to labor:

"It has been repeatedly said by the Administration that it is not the function of N.R.A. to organize either industry or labor. To obtain the benefits of this act, it is not necessary for workers to join either company unions or any particular labor union. Employers may bargain individually with their men. They cannot, however, refuse to bargain with the representatives of labor chosen by labor. They cannot make as a condition of employment that any man either does or does not belong to any particular labor or other union. Employers must not use any indirection or device to evade these provisions. The law will be executed exactly as it is written and the current misrepresentations that a man must join either a company union or a particular labor union in order to get the benefits of the law are entirely without warrant in fact."

A spokesman for the automobile manufacturers, prior to the meeting with General Johnson, made a statement substantially as follows: Labor agitation in an effort to unionize American industry was never more rampant. The Administration fears that strikes may occur in the automobile industry as a result of this agitation. If the industry adopts a code, any disagreement between capital and labor can be handled promptly by Washington. That is what brought General Johnson to Detroit.

In view of the activities of the American Federation of Labor in this district, it is small wonder that automobile executives demanded reassurance from Washington that no attempt would be made to interfere with the open shop. The federation already has chartered six local chapters of the Automobile Workers Union, although it has not announced in what plants these local unions exist. It is known that mass meetings have been called of workers of the Chrysler Corpn., Hudson Motor Car Co. and the Bower Roller Bearing Co. The federation has revealed that a district council has been formed with representatives from each of the six local unions and has asserted that the council will prepare a wage code to be submitted to Washington.

In addition to mass meetings at night, union organizers are addressing noon-day crowds of employees in front of automobile and allied trade plants urging them to organize and get the benefits of the N.R.A.

The Ford Motor Co. wishes time to study the code before it decides whether or not to subscribe to it. In view of Ford's influential position in and importance to the industry there is a possibility that it may file its own code and the intimation from Washington is that no objection would be raised to this procedure.

The automobile industry in southern Michigan today is employing about 190,000 workers. It is estimated that under the code agreement manufacturers will give employment to 60,000 more workers. On July 15 the employment index of the Detroit Board of Commerce stood at 62.4 as against 56.3 on June 15 and 69.6 on July 15, last year. It is believed that the July 30 figure will show a further gain.

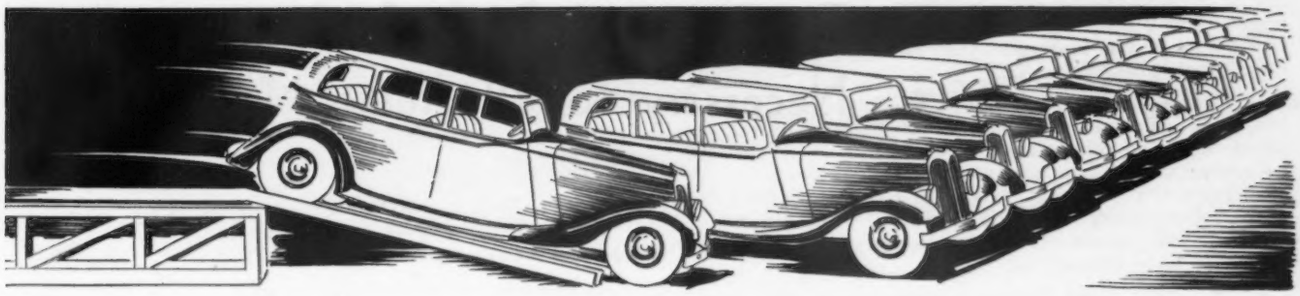
Large Additional Wage Increases at Detroit

DETROIT, Aug. 1. — Automobile manufacturers today put into effect wage increases which will add millions of dollars to the incomes of their employees. The Chevrolet Motor Co. advanced the pay of 40,000 men in its various plants 15 per cent. This is in addition to a previous 5 per cent increase. All salaried employees earning less than $1,800 a year also have been granted a 10 per cent increase. Other General Motors units have announced upward readjustments identical with those of the Chevrolet company.

Following close on the heels of a 10 per cent advance for its employees, Chrysler Corpn. made effective today a second 10 per cent increase in all of its divisions. Packard and Reo likewise have increased the pay of their workers. This action, which has been taken by many other companies directly or indirectly affiliated with the automobile industry, is in line with a resolution recently adopted unanimously by the board of directors of the National Automobile Chamber of Commerce advocating immediate wage increases. It affects about 200,000 workers in the automobile industry itself.

Steel Barrels Show Sharp Increase

WASHINGTON, Aug. 1.—The production of steel barrels rose sharply to 572,851 units or 42 per cent of capacity from 465,916 or 33.9 per cent of capacity in May, according to reports received by the Bureau of the Census from 26 establishments. In the first six months of the current year the output totaled 2,374,651 or 28.8 per cent of capacity compared with 2,712,838 or 31.4 per cent of capacity in the first six months of 1932. Stocks at the end of June were 26,187 against 21,773 at the end of May. Orders at the end of June totaled 641,441, of which 214,949 were for delivery within 30 days and 426,492 were for delivery behind 30 days.



▲▲▲ THIS WEEK ON THE ASSEMBLY LINE ▲▲▲

Production Rises to New Peak for Year

DETROIT, Aug. 1.

THE dramatic visit of General Hugh Johnson to Detroit last Thursday and Friday and the sudden emergence of a code for the automobile industry following his conference with the directors of the National Automobile Chamber of Commerce almost overshadowed the fact that production during the week climbed to a new high point for the year. It now seems certain that assemblies in July totaled 240,000 units. It is believed that output in the first half of August will show little if any decline from last week's level, but it is the consensus of opinion that operations will taper off during the latter part of the month.

Up to July 23 Chevrolet's Flint plant had turned out over 60,000 motors during the month. Although no figures are yet available, it is understood that assemblies for the month by the Chevrolet company were about 80,000 units. Chevrolet is starting August with a tentative schedule of 65,000 units, with a strong likelihood that this will be boosted to at least 70,000. It is even planning on a fairly strong September program.

Increased sales of its V-eight car have compelled Ford to revise upward its rate of activity. Its production last month is estimated at 50,000 units, with 55,000 the goal for August. The contemplated vacation period in the last half of August has been abandoned in favor of continuous operations throughout the month. Certain key production executives are taking their vacations so as to be back on the job by the middle of August. In other years this has meant that a period of intensified work lies ahead, and in some quarters it is believed that the long-heralded small Ford car may be nearer an actuality than the public realizes. It is known that Henry Ford is devoting a large share of his time to the development of the small car.

The Chrysler Corpn., having attained a production of about 55,000 cars in July, is easing its operations somewhat and this month will make 45,000 to 50,000 cars. The Plymouth division is assembling about 1600 cars a day. Hudson is doing fairly well. In fact, a new vigorous spirit animates this organization now that Roy Chapin is back in command. Pontiac's output is still above 10,000 cars a month. Buick reports a better demand for its higher-price series. This is regarded as an unusually significant development, because cars in the higher brackets of the medium-price field have been the slowest in the industry. Willys-Overland has received court permission to make an additional 5000 cars, thus carrying its activities along until about Nov. 1.

The difficulties encountered by motor car companies in securing deliveries of steel have not only resulted in much grief to the mills, but also have been a boon to local steel warehouses which have done the biggest business since 1928 and 1929. Some steel users have given releases for September delivery, although heretofore they have not ordered more than two to three weeks ahead. So far as prices are concerned, there has been a willingness on the part of automobile companies to go along with the higher schedules. There has been a noticeable absence of pressure to keep prices at unhealthily depressed levels.

August and September to Be Good Months

The outlook for automobile sales and production during the remainder of the year is exceptionally bright. Normally August and September are quiet months. With thousands of unemployed going back to work, with wages being increased in line with President Roosevelt's recovery program, and with farmers getting more money for their products, automotive sales executives are convinced that August and September will be good months. The situation assumes a still healthier appearance when one remembers that there has been no overproduction thus far and every car sold by a dealer means that a new car will have to be built by the factory.

It is this brisk current demand for cars which has largely submerged the talk about new models. It is a case of not changing models in the middle of a stream of retail orders. For this reason the introduction of most 1934 lines will be postponed until near the end of the year. The chief exception is said to be Nash, which is planning on introducing in the next 60 days a car reflecting the industry's trend toward more radical streamlining. Buick will not get into production on new models until about the middle of September.

With operations on current lines carrying over into the fall, there is likely to be only a minimum of interruption of manufacture during the tooling-up period. This augurs well for steel demand. Taking a long-range look, the local steel trade sees a moderate amount of fresh business in the next 30 days not comparable in volume with that in June, and then a substantial expansion in releases as the fourth quarter opens up.

Next Year's Cars to Cost More

Automobile production costs are mounting rapidly. Wages have been increased a total of 20 per cent by most companies. More men are to be employed, and raw materials and parts will cost more. This inevitably will lead to higher retail automobile prices. It is believed that this extra cost will be absorbed during the

life of present models, but the public might as well make up its mind that it will have to pay more next year for new automobiles.

Incidentally, new models are expected to offer some interesting innovations. Chevrolet is understood to be contemplating independent spring suspension for its front wheels and also major changes in its motor. Chrysler will concentrate its attention on major body alterations.

Great Lakes Steel Corpn. is still holding its finishing mill operations near full capacity and all six of its open-hearth furnaces are active. Even if mill schedules fall off, it is believed that open-hearth activities will continue at 100 per cent so as to build up a backlog of ingots. It will be recalled that Great Lakes recently went into the open market for sheet bars because its raw steel output could not keep pace with its finishing mill requirements. The Rotary Electric Steel Co. is now assembling its mill crews and will be in production with its new steel-making process not later than Sept. 1.

Detroit Notes

Pig iron shipments to the automobile trade in July were about equal to those in June . . . An Indianapolis foundry which has long specialized in making cylinder blocks is reported to have closed a sizable contract with an important Detroit automobile maker . . . Motor car companies are examining the possibilities of using more rustless steel on 1934 cars than on current models. One company is considering the use of 1½ lb. of rustless steel per car for molding. . . Everyone in the steel trade is rejoicing over the fact that Detroit is eliminated in the steel code as a basing point for bars. All mills, however, are figuring how they can deliver steel here at the cheapest possible price, passing along the saving to their customers. . . City Auto & Stamping Co., Toledo, is making a window ventilator to compete with the Fisher Body "forced draft" ventilation system. It already has a Packard contract and is about to close with several other companies.

June's Fabricated Plate Sales Doubles May's

WASHINGTON, Aug. 1.—June orders for fabricated steel plate rose to 36,958 net tons; more than doubling those of May, amounting to 16,243 tons. Reports made to the Bureau of the Census by 48 manufacturers show that of the June orders, 20,894 tons was for oil storage tanks, and 13,951 for miscellaneous requirements. Orders in the first six months of 1933 totaled 99,322 tons compared with 92,171 tons in the corresponding period of last year.

Expansion of Bank Credit Necessary to Effectuate N. R. A.

By J. L. SNIDER
Associate Professor, Graduate School of Business Administration, Harvard University

THE President's reemployment program aims not only to spread work and income, thereby reducing the numbers of unemployed, but also to increase the total income of the workers of the country. This second objective has been included in order that purchasing by consumers may be raised to a position of balance with the higher level of production attained.

There is, without doubt, an urgent necessity for a larger volume of buying by ultimate consumers, and there is indeed some ground for believing that increased purchases would be made if the purchasing power in the hands of consumers were expanded. Because of restricted buying of the last few years consumers undoubtedly find themselves with a shortage of numerous articles which they would be glad to replenish if they possessed the necessary purchasing power.

But it must be remembered that the various codes which have been drawn up by the industries of the country and the "blanket code" provide for additional outlays *prior* to the receipt of additional income. The funds for these additional outlays must come from the *present* resources of our industries, not from the increased receipts expected later as the result of increased consumer buying.

Our industries, particularly our leading companies, have on hand a considerable amount of cash—the tendency throughout the depression has been to get into a more liquid position and the sharp upturn of business since March has further strengthened their financial situation. But there are very real limits to the possible increases in disbursements from present resources. Expansion of the volume of bank credit is essential if the total volume of wage payments is to be increased substantially. Higher wage payments must be in part "financed" by our banks; our industries should not be expected to shoulder the burden alone.

Fortunately, our banking system is now in a position to expand credit if it determines to do so. There has been some expansion in loans to industry during the recent business upturn, but there are unused bank reserves adequate to support such credit expansion as would seem to be needed in connection with the President's reemployment program.

It would therefore seem desirable for the Administration at Washington to urge upon bankers the necessity of making additional credit available to industry, thus cooperating with industry in carrying the load of increased disbursements provided for in the President's program.

Open Shop Defined by General Johnson

WASHINGTON, Aug. 1.—"As I understand it, an open shop is a place where any man who is competent will be employed regardless of whether or not he belongs to the union. That is exactly what the law says."

This definition of the open shop was given by General Hugh S. Johnson, National Recovery Administrator, last Saturday. It was offered at a press conference when he was asked about labor provisions carried in the automobile code which was filed on that day. These labor provisions declare for continuance of the open shop and for selection, retention and advancement of employees on the basis of merit without regard to affiliation or non-affiliation with any labor or other organization.

General Johnson, replying to further questions, said it does not make any difference what anybody put in a code. "They cannot change a statute by putting it in the code, and if there is a conflict between the code and the statute, the code will be received with those words but will be considered as though they were not in it."

Bright Outlook for Metal Exposition

RESERVATIONS in the fifteenth annual National Metal Exposition, which opens in Convention Hall, Detroit, on Oct. 2, are now far in excess of the total space used at the Buffalo show last year, W. H. Eisenman, secretary of the American Society for Steel Treating, has announced. To date more than 100 companies have reserved nearly 75 per cent of the available exhibit space, assuring the largest Exposition since 1929.

THIS WEEK IN WASHINGTON

Steel Industry Withdraws Controversial Labor Clause

But Union Labor, Taken Unawares, Quickly Shifts Its Attack to Hours and Wages—Green Submits Labor's Code

By L. W. MOFFETT
Resident Washington Editor, The Iron Age

SWELTERING in Washington temperature akin to that of its own furnace fires, the steel industry forgot its physical discomfort upon the opening day of the steel code hearing. Such minor matters as personal well being were soon eclipsed by the evidence of greater discomforts to come through the apparent and expressed intentions of the American Federation of Labor to use the Recovery Act as a direct stepping stone to the domination of industries which heretofore have successfully warded off its dictation.

That this is the fixed purpose of organized labor there could be no doubt in the minds of those who attended this hearing and who listened to the impassioned challenge of President William Green. Nor was there much solace for the cause of independence as exemplified in the company union idea in the remarks of "Madam Secretary" Perkins, just returned from a two-day journey to the steel districts for the purpose of obtaining a first hand education in steel-making management.

With the contentious open shop declaration eliminated from the code, the hearing was shortened and came to an end at 5:30 this (Monday) evening, subject to later call by the administrator if found to be necessary.

Gen. Hugh S. Johnson, administrator of NIRA, opened the public hearings on the steel code, which were presided over by Kenneth M. Simpson, deputy administrator. The General expressed his appreciation of the cooperation given by the American Iron and Steel Institute in presenting a representative code.

After an outline of procedure by Donald R. Richberg, general counsel of NIRA, Robert P. Lamont, president, American Iron and Steel Institute, was called upon to present the code. (Proposed code was published in full in THE IRON AGE of July 27.)

Mr. Lamont showed that the Institute includes in its membership 98 per cent of all the producers of pig iron and steel ingots in the United States. He traced the remarkable growth of the industry in this country. Last to enter this field of manufacture, the United States has become by far the largest producer, he said, its annual output amounting to fully 50 per cent of world production.

In 1897, this country produced less than 1,000,000 tons. This grew to 56,000,000 tons in 1929, an increase in half a century of 5500 per cent. During the same period per capita consumption jumped from 44 lb. to 1044 lb.

Directly employing in normal times 400,000 individuals the industry with its collateral branches affords jobs for 900,000, and has a total payroll of $1,500,000,000 a year, or $5,000,000 for every working day. Before the depression, Mr. Lamont said, steel paid an average of $430 per year per employee more than the average of all manufacturing industries. But the depression adversely affected steel more heavily than many other industries, he declared, and during the best two years production had fallen to 25 per cent of normal.

Despite the decline Mr. Lamont contended that the industry had made every effort to combat the depression and prior to the formulation of its code had put into effect a wage increase costing the members of the industry $5,000,000 a month.

IN commenting upon the various articles and sections of the code as submitted by the institute, Mr. Lamont touched upon the much discussed "company union" clause as follows:

"Section 2 states that the plants of the industry are open to capable workmen without regard to their membership or non-membership in any labor organization, and expresses the belief of the industry in the soundness of the principles of collective bargaining under which certain members of the industry have dealt with their employees, and that the rights of the employees and members of the industry to b a r g a i n collectively through representatives elected or appointed and acting in accordance with employee representation plans referred to in such section should be preserved and protected."

Secretary Lamont next briefly reviewed the section which proposed a maximum average of not more than 40 hr. per week in any six months' period and also the sections pertaining to proposed wage rates, these varying from a minimum of 25c. an hour for unskilled labor in the Southern district to 40c. an hour in Pittsburgh, Cleveland, Chicago and a number of other districts. He then dwelt briefly upon the various sections of the proposed code dealing with matters of trade practice.

Justification of Proposed Hours and Wages

President Lamont then returned to the proposals of the institute regarding working hours and wages, furnishing supplementary data "so that it may be seen that the provisions of the code regarding them are reasonable and proper."

Dealing with the matter of hours, Mr. Lamont pointed out that "since

the beginning of the present depression the members of the industry have made every effort to distribute the hours of work available in their plants so as to give employment to the maximum number of employees. It is well known that the industry was the leader in the share-the-work plan and we are proud of the results accomplished.

"'The institute'," said Mr. Lamont, "recently obtained from 32 of the largest companies in the industry, which, in the aggregate, operate about 94 per cent of the country's steel ingot capacity, information regarding the employment conditions in their plants. This information has been summarized in a statement entitled 'American Iron and Steel Institute Statement of Employment Conditions and Rate of Operations in the Steel Industry.' Such statement shows the employment situation as it existed on or about July 1, 1933."

Length of Working Week

In considering the question of the working week, the institute assumed that it was imperative to establish such maximum hours of work per week as would enable the industry as a whole to operate at a fair normal rate. "We believe," said Mr. Lamont, "that an average rate of the operations in the years 1929 and 1930 is fairly normal. In 1929 the industry was operating considerably above normal and in 1930 operations were subnormal. The average for the two years by the 32 reporting companies was 75.3 per cent of capacity, which was about equal to the rate of operations in 1927.

"In these two years, 1929-1930, the reporting companies employed an average of 341,654 employees at their plants producing pig iron, iron or steel ingots or rolled or drawn iron or steel products and in the administrative and sales forces employed in connection therewith.

"These employees worked an average of 49.5 hr. per week during this two-year period.

"The employment records of these companies further show that on July 1, 1933, there were 338,683 persons available for service for such companies. Of this number 288,945, or 85.3 per cent, were being given some work and these employees were working at an average rate of 41.9 hr. per week on or about that date, when operations did not exceed 50 per cent of capacity. No work was being given to 49,738 individuals, or 14.7 per cent of the available force.

Labor Shortage Impends

"The statement which I have submitted also shows that, in order to operate at the 1929-1930 average rate of 75.3 per cent of capacity and at the operating efficiency then prevailing on the basis of a maximum 40-hr. week, 424,083 employees would be required to do the work. But, as stated, the total number of men available and looking to these companies for work is 338,683. Therefore, the excess over the present available supply of men which would be required on the basis of a 40-hr. week is 85,400.

"These results show that the number of workers now available to these companies is not sufficient to permit their mills to operate at the 1929-1930 average rate on a 40-hr. maximum working week. Of course, if operations should exceed the 75.3 per cent average rate prevailing in 1929 and 1930, the shortage of labor would be come even more acute. It is estimated that on the basis of a 60 per cent rate of operations and a maximum 40-hr. week substantially all of the 49,738 employees who were not receiving any work on July 1, 1933, would be given employment, if qualified and available for the work.

"On less than a 40-hr. week the industry positively could not operate the mills and meet any demands upon them materially in excess of present production; and, as shown by the statement which I have submitted, such demands could not be met with present available forces on a rate of operations equal to the average of 1929-1930."

American Iron and Steel Institute Statement of Employment Conditions and Rate of Operations in the Steel Industry

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)		
Company	Actual average number of employees, years 1929 and 1930	Average number of hours worked per man per week, years 1929 and 1930	Average per cent operations, years 1929 and 1930	Total number of employees scheduled as available for and wanting work on or around July 1, 1933	Total number of employees who are being given some work on or around July 1, 1933	Average number of hours worked per man per week of employees in column 6	Per cent of employees given some work, column 6 divided by column 5	Per cent operations at or around July 1, 1933	Number of employees who are at present getting no work, column 5 minus column 6	If maximum hours of work per man per week were limited to 40 hrs., how many men on basis of average operations in 1929-30 would be given work?	
										Total number	Excess No. over col. 5
U. S. Steel Corpn.....	139,622	47.5	78.6	138,694	115,466	41.6	83.3	55.0	23,228	165,931	27,237
Bethlehem Steel Co.....	43,679	53.2	76.0	44,700	33,848	35.7	75.7	44.5	10,852	58,073	13,373
Republic Steel	22,322	51.1	62.0	21,446	19,349	43.4	90.2	51.5	2,097	28,532	7,086
Jones & Laughlin.....	16,753	48.9	76.9	15,072	14,439	41.4	95.8	48.2	633	20,490	5,418
Youngstown Sheet & Tube	15,931	57.0	75.5	15,667	13,873	37.5	88.5	50.4	1,794	22,707	7,040
American Rolling Mill...	9,477	45.6	65.3	8,867	8,287	46.1	92.5	69.8	580	10,804	1,937
National Steel Corpn.....	13,158	52.4	71.6	14,689	14,689	47.6	100.	81.5	...	17,242	2,553
Inland Steel Co.....	6,824	46.3	81.9	6,500	6,231	42.3	95.9	63.3	269	9,190	2,690
Wheeling Steel	11,043	52.3	77.5	13,736	12,633	46.3	92.0	80.8	1,103	14,426	690
Colorado Fuel & Iron Co..	6,246	40.9	79.8	5,146	2,696	28.2	47.7	19.5	2,450	5,884	738
Crucible Steel	8,022	50.0	71.0	8,022	5,358	38.0	67.0	46.0	2,664	9,750	1,728
Corrigan McKinney	3,223	46.9	65.5	3,244	3,187	50.3	98.2	87.4	57	3,739	495
Newton Steel	2,639	57.3	51.0	1,367	1,293	52.5	93.6	36.5	74	3,746	2,379
Otis Steel Co.	3,685	54.1	74.2	4,034	4,034	49.3	100.	72.5	...	5,408	1,374
Pittsburgh Steel	5,962	48.1	64.2	6,126	4,998	40.8	81.6	39.8	1,128	7,159	1,033
Gulf States Steel Co.....	2,157	62.7	73.6	2,282	2,152	49.3	94.3	74.2	130	3,368	1,086
Roebling's Sons	4,464	46.9	81.0	4,495	3,225	44.7	71.7	49.0	1,270	5,240	745
Spang Chalfant	3,102	52.2	69.0	2,361	2,289	37.7	96.9	42.3	72	4,047	1,686
International Harvester ..	2,800	42.6	75.8	2,236	1,936	40.7	86.4	46.7	300	3,020	784
Granite City Steel	2,278	42.6	60.4	2,410	2,360	41.0	97.9	62.5	50	2,426	16
McKeesport Tin Plate....	2,870	43.0	89.0	2,876	2,876	48.3	100.	100.	...	3,085	209
Sharon Steel Hoop Co....	1,983	52.5	73.3	2,135	2,008	47.3	93.8	56.3	127	2,612	477
Newport Rolling Mill....	1,403	46.9	82.7	1,009	1,009	40.3	100.	58.7	...	1,645	636
Continental Steel Corpn..	2,409	44.2	75.0	2,352	2,333	48.2	99.1	70.0	19	3,379	1,027
Acme Steel Company.....	1,627	44.2	66.8	1,513	1,488	53.3	98.5	74.1	25	1,796	283
Lukens Steel Company...	2,000	57.0	89.6	1,862	1,534	46.8	82.4	50.2	328	2,821	959
Byers (A. M.) Company..	1,491	41.2	50.3	1,286	1,009	34.4	78.5	17.2	277	1,398	112
Keystone Steel & Wire...	1,196	47.4	85.0	1,160	1,147	46.8	98.7	85.0	13	1,373	213
Central Iron & Steel.....	811	65.6	70.8	849	779	59.8	91.2	50.0	70	1,325	476
Phoenix Iron Company...	857	55.5	85.1	685	662	44.0	96.6	50.0	23	1,017	332
Laclede Steel Company...	918	57.2	64.0	1,212	1,192	52.0	98.3	57.6	20	1,452	240
Worth Steel Company....	702	56.9	57.1	650	565	47.6	87.0	28.1	85	998	348
Total.....	341,654	49.5	*75.3	338,683	288,945	41.9	85.3	54.7	49,738	424,083	85,400

* American Iron and Steel Institute total average steel production rate—1929-30.

Commenting upon the proposal regarding minimum district wage rates, Mr. Lamont said:

"The code establishes a minimum rate of 40c. an hour for common labor in wage districts which produce 65 per cent of the total output of the industry. These districts, as I have stated, are the Pittsburgh, Youngstown Valley, North Ohio River, Canton, Massillon and Mansfield, Cleveland, Detroit-Toledo, Chicago and Colorado districts. On the basis of a 40-hr. week, this 40c. rate would result in minimum average weekly earnings for unskilled labor of $16.

"This minimum hourly rate compares with the following hourly rates paid in various periods since Sept. 1, 1922:

From Sept. 1, 1922 to April 16, 1923	36¢
From April 16, 1923, to Aug. 16, 1923	40¢
From Aug. 16, 1923, to Oct. 1, 1931	44¢
From Oct. 1, 1931, to May 15, 1932	39¢
From May 15, 1932, to July 15, 1933	33¢

"Thus the proposed 40c. rate for unskilled labor is only 9.1 per cent less than the highest base rate paid during the past 11 years, when living costs were far above the present level.

"The Department of Labor reports that the cost of living declined by 24.6 per cent from June, 1929, when the 44c. rate was paid, to June, 1933. The proposed rate of 40c. an hour, therefore, is the equivalent in purchasing power to a 53c. rate in 1929, and the minimum weekly earnings of $16 have a purchasing power equivalent to $21.20 in 1929. Other classes of labor are paid substantially higher rates and even during recent months the average hourly earnings of wage earners in the industry (excluding the salaried and supervisory forces) have been between 48 and 50c. That average hourly rate is thus roughly equivalent in purchasing power to a rate of 63 to 66c. in 1929, which is a higher rate than was paid in that year. The 15 per cent increase proposed in the code will, therefore, increase average earnings of all wage earners to between 55 and 58c. an hour, which is the equivalent in purchasing power to between 74 and 77c. an hour in 1929—well above the rates actually paid in that year.

"It must be remembered," said Mr. Lamont, "that the steel industry has always paid, and under the code proposes now to pay, hourly and weekly rates substantially above those paid in most other industries."

Losses in the Steel Industry

He then called attention to the losses sustained by the steel industry. "A recent compilation of the earnings of 1410 large corporations, including 56 different industries, shows that 21 of the so-called light industries earned $473,000,000 last year. The remainder of the 56 industries, almost entirely in the heavy industry group, suffered losses aggregating over $578,000,000. The net loss of the 56 industries was, therefore, over $105,000,000. The steel industry with a loss of $161,000,000 bore the largest share of such loss of $578,000,000.

"Speaking generally, the steel industry has not made any money during the past two years. On the contrary, it has drawn heavily on its reserves and working capital. The losses for the first quarter of the present year were approximately at the same rate as last year. Increased activity of the second quarter reduced the losses, but the industry was not yet on an earning basis. Notwithstanding all these losses, the industry has, as I have before stated, put into effect an increase in wages involving an immediate increase in cost to the members of the industry of at least $5,000,000 a month."

Basing Points and Price Determinators

COMMENTING upon the sections having to do with trade practices in selling, Mr. Lamont said, in part:

"In general, the ultimate price to the consumer for the products of the industry has heretofore been, and under the code will continue to be, made up of three factors, namely, (a) the base price, that is, the price at multiple basing points (shown in Schedule G) in accordance with the practice that has obtained in the industry since shortly after the decision of the Federal Trade Commission in the Pittsburgh basing point case; (b) extras, which have been customarily added to, or deductions customarily made from, the base price for quality, sizes, and so forth; and (c) discounts for early payment and interest where the invoice of products is not paid on the due date.

"The code provides that each member of it shall always have on file with the Secretary, open to examination by all interested, lists of its base prices for all its products and that it shall not sell them on the basis of the base prices lower than those shown in such lists at the time in effect. Thus, each member of the code as well as the public can know at all times at what prices a particular member may sell its products, and they, producer and consumer, are guaranteed, in so far as possible, freedom from deception and misrepresentation in that regard. The rates of extras, the percentages of allowable discounts and deductions to which I have referred and the minimum terms of payment under the provisions of the code will also be an open book, and in respect of them as in respect of base prices all parties interested can know the charges or deductions which any member of the code may make for these factors.

"In preparing this business part of the code the members thereof have had in mind what they have believed to be one of the purposes of Title I of the National Industrial Recovery Act, namely, to eliminate in so far as possible in the industry discrimination in price among its customers. Where specific provisions in this regard did not appear to be possible, power has been vested in the board of directors of the institute to consider specific cases or cases of a general class and to make such rules and regulations as will accomplish the desired purpose. In this respect it is recognized that the code may go further than Section 2 of the Clayton Act. If this be true, then it is because of the desire of the industry to accomplish what is believed to be the policy of the law as declared in that section—to prevent discrimination in prices.

"In conclusion," said Mr. Lamont, "I should refer to the provisions of Section 3 of the National Industrial Recovery Act which specify the conditions under which the President may approve our code. We believe that our code fully meets those conditions."

Lamont Withdraws Qualifying Labor Section

AFTER Mr. Lamont had completed his explanation of the code, Administrator Johnson expressed his opinion that Section 2 of Article IV (relating to company unions in the steel industry) was inappropriate and of questionable legality from the standpoint of the Recovery Act. Then came the dramatic and unexpected withdrawal of this section by the president of the institute.

"Mr. Administrator," said Mr. Lamont, "I rather anticipated such a question and I am prepared to answer it.

"Section 2 of Article IV was put in the code merely to express the belief of the industry that the open shop principles that have prevailed throughout the country for many years should be maintained, and that the principles of collective bargaining should be established and maintained in a form which experience has shown to be satisfactory to the industry and its employees. We felt that it was desirable to state frankly our position on these two points in order to avoid the possibility of any misunderstanding by anyone. In including Section 2 in the code, however, we did not intend to inject into this hearing for consideration and question as to the merits of the employee representation plans, referred to in the section, or of any other method of collective bargaining.

"I believe that the section can be omitted from the code without materially altering it. I am willing to recommend that it be omitted and I believe that the industry will adopt my recommendation.

"It should be distinctly understood, however, that the omission of the section does not imply any change in the attitude of the industry on the two points therein referred to, that the industry believes that the employee representation plans now in effect at its plants are desired by its employees; that the members of the in-

dustry will naturally do everything in their power to preserve the satisfactory relationships now existing with their employees; and that the section will be omitted for the sole purpose of avoiding the necessity of considering at this hearing any questions that are not fundamental to the code."

Later, at a special meeting of the institute board, the withdrawal of this section was affirmed.

Southern Minimum Raised to 30c.

Prior to a subsequent attack upon the proposed rates of pay for common labor as set forth in the code by "Madam Secretary" Perkins, by William Green, by a host of lesser organized labor lights and a variegated phalanx of "social minds" ranging from clergy to Communist, the members of the institute from the Southern and Birmingham districts voluntarily increased their proposed minimums of pay from 25 and 27c. an hour, respectively, to 30c.

General Counsel Richberg, for the recovery Administration, questioned Mr. Lamont concerning the institute's interpretation of the effect of several clauses in the proposed code. One of these had to do with the omission from the machinery of the code of consumer representation as a matter of public protection in prices. Mr. Lamont pointed out that price competition, above the level of below-cost selling, would still continue under the code set up.

Another of Mr. Richberg's questions had to do with the effect upon public interest of the agreement to restrict expansion of ingot capacity, and another as to the procedure to be followed by the institute board in investigating and correcting instances of suspected selling below cost.

Green Lets Labor's Cat Out of the Bag

THAT organized labor considers the Industrial Recovery Act a labor act was clearly indicated by the testimony of President William Green of the American Federation of Labor. This was exhibited in the standard suggestion of organized labor for a 6-hr. 5-day week, with increased pay, for the iron and steel industry, but was emphasized to a much more important degree by the suggestion of Mr. Green that the industry be policed by an advisory council on industrial relations. This would consist of seven members. Three each would be selected from the American Iron and Steel Institute and from the American Federation of Labor. The other, to act as chairman, would be chosen by the President.

Other industries will no doubt watch with much interest this proposal on the part of organized labor, which, despite many attempts, has failed to gain entrance into the iron and steel industry and other heavy industries of the country. The ease with which organized labor would gain an equal voice with industry in its conduct is made manifest from this rather startling suggestion made by Mr. Green. The three members from the American Iron and Steel Institute would be selected from a list of 10 submitted by the institute and the three representatives of the American Federation of Labor would be selected by Mr. Green. Non-union labor, which represents 90 per cent of all the nation's labor, would be given no choice as to selection of its representatives on the council. The proposal, once given official recognition in the iron and steel industry, obviously would be recommended for all other industries. Yet Mr. Green suggested the plan in order to prevent "conflict between a code presented by employers and one presented by labor."

Mr. Green went on to say that struggle and conflict have often—"far too often—been characteristic of industrial relations. This has its unfortunate features at any time, but it is especially unfortunate when a great cooperative effort is being made to rout unemployment and to restore prosperity and security."

Green Attacks Dead Company Union Clause

Despite the fact that Mr. Lamont had withdrawn the open shop declaration from the code, Mr. Green made a vigorous attack on the declaration, centering his attack principally on Mr. Lamont's statement that although the declaration would be withdrawn it was the purpose of the iron and steel industry to maintain its principles of collective bargaining and the company union, which were said to have been mutually satisfactory to employers and employees. This supplemental statement by Mr. Lamont was declared by Mr. Green to be "highly objectionable."

"If there is a new deal for industry, then there should be a new deal for labor," Mr. Green stated. "Under the new deal, workmen have the right of collective bargaining through representatives of their own choosing, free from restraint or interference."

Mr. Green said that this meant workers must have the right to organize as they wish and he challenged the iron and steel industry to permit workers to select their representatives by secret ballot without company interference. He said organized labor would abide by the result.

His proposals for the 6-hr. day, 5-day week, and higher wages were more extreme than those of Secretary of Labor Frances Perkins, who also attacked the working hours and rates of pay provided in the iron and steel code.

Mr. Green said that if the iron and steel industry would join in the creation of the proposed advisory council on industrial relations, labor would leave to the judgment of the administrator of the Recovery Act what wages should be paid and what hours should be worked, "pending a careful, impartial study of the whole situation and a resulting recommendation to the Administrator by this advisory council." Such a study, Mr. Green stated, should be completed within a month or six weeks of the date of the appointment of the council. To his mind such a council would greatly reduce points of tension and conflict and would pave the way for even more constructive work in the future.

"Most significant of all," Mr. Green continued, "it would be an earnest of a new mental attitude, on the part of both employer and worker, in attacking their joint problems of industrial relations."

Union Labor Presents a Steel Code

NEVERTHELESS, organized labor through Mr. Green submitted a proposed code for the iron and steel industry. Starting with the labor provisions of the Recovery Act, it proceeded to set up the 30-hr. week, with a minimum hourly rate of 60c. for common labor and a minimum weekly rate of $18, "regardless of whether the employee is compensated on the basis of a time rate or a piece-work performance."

Employees receiving pay at a rate in excess of the hourly rate of common labor, within three weeks of adoption of the code, would receive "reasonable increases in their rates of pay." As an emergency standard of reasonableness, organized labor proposes that the weekly pay of such employees shall be approximately 70 per cent of the weekly compensation of similar work in 1929, regardless of whether a given employee is compensated on the basis of a time rate or a piece-work performance. In no case would the pay be lower than that now prevailing.

Barring employment of persons under 16 years of age in or about plants and none under 18 in manufacturing and machanical work, the American Federation of Labor code for the iron and steel industry sets up its principle for the advisory council, giving itself equal voice with the industry.

"The advisory council," it suggests, "acting either on its own initiative or on assignment by the administrator, shall be the agency of the national recovery administration for investigating and reporting to the administrator on matters of current friction in industrial relationships. The administrator, subject to the approval of the President if required by law, may assign to the advisory council such of his administrative powers as he may choose, and for such periods of time as he may choose."

Secretary Perkins Argues for Shorter Hours

It is interesting to compare these organized labor suggestions with those made by Miss Perkins, who, fresh from

a visit to steel plants in the Pittsburgh district, presented an exhaustive discussion of the steel code. Impractical though some of her proposals were considered to be by some, Miss Perkins' manner of setting forth her case and its delivery made an impression on the large audience. Evidently submitting her suggestions in a fair spirit, she frequently paid tribute to the iron and steel industry for its progress not only in technical development but in caring for its labor, and particularly for its accomplishment in the field of safety work, comfort and sanitation. In her proposal to raise wages, shorten hours, and otherwise alter the code submitted by the industry, she expressed the hope that iron and steel as one of the great basic industries would lead the way for others to follow. She especially made the point that wages must be increased and hours shortened in order to build up purchasing power and employment as a means toward economic recovery.

ON hours of work, she did not suggest the exact number, but expressed the conviction that the 40-hr. week is too great to accomplish the purposes of wide reemployment. She also urged at least one day of rest in seven. Just what the hours per week and per day ought to be, she said, will have to be determined by the number of iron and steel workers now unemployed that have to be reabsorbed in the industry, and to a certain extent by the technical process of the industry. She said it should be possible to shorten the hours both of the day and of the week and still to make provisions for continuous operation of machinery where that is necessary through alternating shifts of workers.

Approaching concrete proposals, she made suggestions not far apart from those of Mr. Green:

"Thirty hours per week, which is 6 hr. for five days, offers interesting opportunities for reemployment of large numbers of persons—one or two roving shifts in the portions of the industry which are necessarily continuous, and this will of itself make for additional employment."

Steel Workers Tell How Long They Want To Work

She observed that "in the limited opportunities I have had to ask steel workers their own personal opinion as to what should be a desirable day's work, they almost invariably say 'six hours is enough, lady.'" She said that the 7-day week still persists in the iron and steel industry, with 34 per cent of open-hearth workers and 28 per cent of blast furnace workers on this basis in 1931. Outside of the sheet, tin plate and puddling mills, she said, each of which reported to the Bureau of Labor Statistics, Department of Labor, one per cent of the workers on a 7-day schedule, the least 7-day labor was found in bar mills, with 10 per cent working seven days at least part of the time. She said that working hours should be reduced in order to provide employment for more than 150,000 iron and steel workers now out of employment. It was also pointed out that some of those working are engaged only part of the time.

The wages in the code, Miss Perkins said, "do not show the generous estimates that will be necessary to accomplish the main purpose of the Recovery Act, viz.: to provide increased purchasing power for those who are employed and, through that, additional employment in other industries for those now out of work. But it is particularly important that the iron and steel industry be generous in this matter of wages, as its wage standards establish a sort of ceiling for many other industries in which its products are used."

It may not be necessary, she declared, to make drastic increases in wages to accomplish the purpose of the act. But, it was stated, if recovery is to be achieved a large portion of the money product of industry must go to those who constitute the main body of consumers.

Cites Statistics of Wage Distribution

"That this may be difficult to accomplish and may have to be done in several steps is conceded; but that it can be done without danger to the industry is evident from the declining share of the value of the products of the iron and steel industry that went to labor during the prosperous years prior to 1930. Bureau of Census figures indicate that wages of blast furnace workers, as compared with the value added by manufacture, declined from 43 per cent of the value in 1914 to 26 per cent in 1929. In steel works and rolling mills the ratio of wages to value added by manufacture was 57 per cent in 1914 and again in 1923, but in 1929 it had dropped to 47 per cent. Four-fifths of this decline took place in the two-year period 1927-1929. During these two years the value added increased over $370,000,000 while that of wages rose only $88,000,000."

MISS PERKINS also criticized the proposal to divide the country into 21 separate wage districts with differentials of 2c. and 3c. an hour. Mr. Green and other witnesses who followed Miss Perkins also attacked this plan of dividing the country into so many wage districts. They shared the view of Miss Perkins that "it has the appearance of an arbitrary fixing of wages that can hardly be justified by differences in costs of living." She said that if separate wage zones are needed they should be established only after the most careful research. The number of such zones, Miss Perkins declared, should be strictly limited to a very few that are dictated by essential and substantial differences "and not by the mere fact that some employers may have been in a position to press the common labor rate down a few cents lower than others. If this is not done one of the worst forms of unfair competition may be perpetuated, namely, that which is brought about by those who cut labor rates. An industry which has been given the privilege of preventing unfair price competition must assume the responsibility also of preventing unfair wage competition."

She emphasized as important the necessity of making the minimum rate of pay a weekly wage rather than an hourly rate. From the point of view of the management of an industry, she said, hourly rates are important as measures of unit costs. But from the point of view of wage-earners, it was stated, their families and the purchasing power of the nation, it is the normal weekly earnings that are important.

Turning to other suggestions, Miss Perkins said:

Complaints to Department of Labor

"Espionage, over-speeding, the long day and 7-day week, and irregularity of hours and of employment are the sources of the major complaints that have come to me regarding working conditions in the iron and steel industry. Whether the complaints are justified or not, these are the unfair practices that working people are concerned with and the labor provisions of a code of fair competition should assure them that both the management of the industry and the Government are intent upon eliminating these sources of complaint, so far as it is possible."

Unemployment and uncertain incomes, it was pointed out, are inevitable consequences of the operation of the industry, and through no fault of those who are charged with the responsibility for its management. She said, however, these circumstances offer an opportunity for leadership and pioneering in making provision for stability and security of the labor incomes in the iron and steel industry that she hoped the management will not overlook.

"The steel industry," she continued, "has not only taken the lead in eliminating the risks of industrial accidents, it has also pioneered in stabilizing prices and dividends. I want to appeal to the same kind of leadership to assure a measure of stability for the incomes of the working people."

Miss Perkins turned to a reference by Charles M. Schwab at a meeting of the American Iron and Steel Institute in May, 1932, to the need of new management policies that will eliminate irregularity of employment. She said he added that the plans for unemployment insurance which were being widely discussed must also be given serious study as a means of providing some income for those who are inevitably thrown out of work.

"May I suggest, therefore," she

said, "that the New Deal, which gave rise to the Industrial Recovery Act and on which it is the intention to build a new and more lasting prosperity, calls for new views and new methods as to the disposal of surplus profits in times of prosperity over and above normal dividend rates."

SHE declared that it is not unreasonable to ask the iron and steel industry to be the first that will on a national basis provide unemployment reserves for its unemployed workers. If possible, she said, such a provision should be included in the code.

In suggesting revision of the wage schedule so that there would be not more than two areas with reference to the actual cost of living, Miss Perkins proposed that the difference between the lowest and highest wages should be raised to a point which will put the lowest paid workers in the lowest cost of living area into the substantial purchasing class. She said the white collar people or clerical workers should be covered by the code and that provision should be made for time off for eating for every shift.

In speaking of the "definite elimination" of the open shop provisions in the code, Miss Perkins said she "could not refrain from thanking the steel industry for withdrawing it."

Mr. Green, however, did not dismiss the matter so easily. On the contrary he took Mr. Lamont to task.

Mr. Lamont's statement that the iron and steel industry proposed to continue the employer-employee representation plan, known as the company union, Mr. Green asserted, leaves much to be cleared up. He said that the statement ought to be either withdrawn or put into the code.

"If I understand this statement," said Mr. Green, departing from his prepared manuscript, "even if the steel industry has withdrawn the company union section from the code it is nevertheless advising the administrator of the Industry Recovery Act that it is its purpose to back and apply that section which they have withdrawn."

Despite the fact that Mr. Richberg reminded Mr. Green that the open shop declaration was taken out of the code and therefore was not a matter for discussion, Mr. Green elaborated on the subject.

Richberg Halts Green's Attack

"You face an unusual situation," Mr. Richberg pointed out to Mr. Green. "A part of the code brought in originally has been withdrawn. It is our understanding that all that is before the Administration on labor provisions is Section 7 of the law, written into the code. All other matter before us is subject to modification but we should make no issue of what you say (about withdrawal of the open shop declaration) and what is in the code. It is not before us. How one party may interpret it may plague us in the future but it is not before us now. We are not concerned over what Section 7 means. I think that we know what it means."

"It appears to me," Mr. Green replied, "that the deputy administrator can determine whether or not the employer-employee representation plan is desired by the workers in the industry as Mr. Lamont says it is. It is our understanding it is not."

Mr. Green then suggested that employees be permitted to vote by secret ballot on the employer-employee representation plan and adopt the plan favored by the majority. His prepared statement had urged the open shop declaration be stricken from the code. This statement had been distributed to the press before withdrawal of the code was proposed by Mr. Lamont.

H. A. Fitch, president, Kansas City Structural Steel Co., representing the Central Fabricators' Association, asked for inclusion in the code of a provision modifying the proposed basing point practice. He suggested elimination of the possibility of discrimination among fabricators through F. I. I. arrangements whereby the mills help pay the freight charges for some fabricators while refusing to pay these charges for others. He declared that unless this is done, Chicago fabricators must buy from Eastern suppliers, thus saving $4 per ton, Pittsburgh fabricators would buy in Buffalo and vice versa, thus adding to the ultimate cost of steel. Mr. Fitch also asked for designation of the place of delivery for identified structurals as the freight station at or near the proposed erection point instead of at the shop of the fabricator. Protest likewise was made with regard to price discrimination between jobbers and fabricators.

W. H. Jackson, president, Pittsburgh-Des Moines Co., and vice-president of the Steel Plate Fabricators' Association of Chicago, filed a formal protest to sub-division (B) of Class 4 Schedule F, offering substantially the same objections as given by Mr. Fitch.

Benjamin Schwartz, director-general of the Institute of Scrap Iron and Steel, requested amendment of Section E of Schedule I, to eliminate reciprocal trading in scrap between mills and customers.

W. J. Harris, vice-president of the American Car & Foundry Co., urged the naming of St. Louis as a basing point on plates, shapes and bars in order to equalize competition of his company with Chicago plants. Under the practice proposed in the code, which does not name St. Louis as a basing point, the Chicago car builders, he said, would have an advantage of from $38 to $86 per car. A telegram from the mayor and chamber of commerce of St. Louis also requested that St. Louis be made a basing point for plates, shapes and bars. Benjamin F. Faunce, president of the Johnstown, Pa., chamber of commerce, asked that that city be made a basing point for iron and steel.

F. A. Fetter, economist, at the request of the consumers' committee, appeared and requested the substitution of a mill basis for the basing point system.

Tool Dealers Complete Preliminary Code

NATIONAL Industrial Recovery Administration committee of the National Machine Tool Builders Association has completed the preliminary draft of a code of fair competition for machine tool distributers. Copies of the proposed code have been mailed to the trade, and early action is expected.

Institute of Metals to Hold Jubilee Meeting

A SILVER jubilee meeting will be celebrated by the (British) Institute of Metals at Birmingham, England, Sept. 18 to 21. The institute was founded in 1908. Among the papers scheduled for presentation are the following: Distribution of porosity in aluminum and copper ingots, by N. P. Allen; temper-hardening copper alloys containing nickel and aluminum, by Dr. H. W. Brownsdon, Dr. Maurice Cook and H. J. Miller; polishing of plated and other surfaces, by Dr. O. F. Hudson; precipitation-hardening nickel-copper alloys containing aluminum, by D. G. Jones, Dr. L. B. Pfeil and W. T. Griffiths; metallurgical progress, by Dr. W. Rosenhain; aluminum-rich aluminum-copper alloys above 400 deg. C., by Dr. D. Stockdale.

Motor Car Production in June Over 250,000

WASHINGTON, Aug. 1.—The largest since May, 1931, motor vehicle production in the United States in June rose to 253,322 units, compared with 218,303 in May. The output of passenger cars was 211,448 against 184,644 while the production of trucks was 41,839, compared with 33,605. In the first six months of 1933 the production of motor vehicles in the United States aggregated 1,007,110 compared with 871,448 in the corresponding period of last year. The 1933 production consisted of 847,917 passenger cars, 157,876 trucks and 1317 taxicabs. The first-half production in 1932 consisted of 730,808 passenger cars, 140,105 trucks and 535 taxicabs.

Steel Production Threatened by Labor Trouble in Coal Region

Demand Is Sustained, and Ingot Rate Holds at 57 Per Cent— Pig Iron Output Up 39 Per Cent in July

STEEL demand is showing unexpected staying powers, and ingot production remains unchanged from a week ago at 57 per cent of capacity. At Pittsburgh, operations have declined from 50 to 49 per cent, at Chicago from 56 to 52 per cent, at Buffalo from 60 to 57 per cent and in the Wheeling district from 90 to 85 per cent. On the other hand, production in the eastern Pennsylvania district has risen sharply from 41 to well over 47 per cent, the rate in the Cleveland-Lorain zone has advanced from 67 to 69 per cent, and there have been slight gains in minor centers.

From present indications steel output this month is less likely to be affected by seasonal influences than by a shortage of fuel. Efforts of the United Mine Workers to unionize coal and coke operations in southwestern Pennsylvania have assumed threatening proportions, in some cases causing entire suspension of work. Continuance of these labor difficulties for any length of time might well result in the exhaustion of accumulated supplies of fuel and pig iron, with an ultimate curtailment or stoppage of steel production at various plants.

THE trouble in the coal and coke region has already had some effect on operating plans. A Cleveland steel company, which had prepared to blow in a blast furnace, has deferred lighting it until the fuel outlook clears up. A new uncertainty has appeared to perplex buyers of iron and steel. Recent purchases to escape higher prices may now have to be followed by well distributed orders to insure deliveries.

DEMAND from the automobile industry, the largest single consumer of iron and steel, is holding up unusually well. Production of motor cars last week reached a new high point for the year and assemblies for July are expected to total 240,000 units. Output in August, according to present indications, will compare favorably with the performances of June and July. Chevrolet and Chrysler may turn out fewer cars than in July, but Ford's schedule calls for 55,000 units as compared with an estimated output of 50,000 last month.

The pressure of motor car companies for steel has been such that Detroit warehouses have done the biggest business since 1928 and 1929.

PIG iron producers have also been pressed for deliveries, not merely by the automotive foundries but by melters generally. In a few instances July shipments of pig iron have been the largest for any month since 1929.

Pig iron production in July was 1,819,438 tons, or 58,692 tons daily, compared with 1,265,007 tons, or 42,166 tons per day, in June. The rate of output was the highest since May, 1931. The month saw a net gain of 16 active furnaces.

Makers of heavy rolled steel products will benefit from the Government's naval program. For 16 vessels allotted last week to Navy yards for construction, the steel requirements include 21,775 tons of plates, 9475 tons of shapes and 7000 tons of stainless steel sheets. For 21 vessels on which bids have been taken from private builders 45,450 tons of plates and shapes will be required.

Fabricated structural steel awards for the week aggregate 33,135 tons. More than 900 Government building projects, calling for 160,000 tons of steel, have been officially sanctioned, although appropriations have not yet been granted on individual projects. Twenty-two States have received Federal approval of loans for road work and the first bids for highway steel will be opened in New York, Aug. 11.

Exports of iron and steel in June, owing to a decline in scrap shipments, dropped to 102,581 tons from the May total of 123,069 tons. Imports rose to 34,368 tons from 26,295 tons in May.

Owing to a further slight upward adjustment in delivered prices on Southern pig iron, THE IRON AGE pig iron composite has advanced from $15.90 to $15.94 a ton. Silvery pig iron has been advanced in its various grades $1.25 to $9.25 a ton. The finished steel and scrap composites are unchanged at 1.973c. a lb. and $12.08 a ton respectively.

▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	Aug. 1, 1933	July 25, 1933	July 5, 1933	Aug. 2, 1932
Per Gross Ton:				
No. 2 fdy., Philadelphia	$17.34	$17.34	$16.34	$14.34
No. 2, Valley furnace	16.50	16.50	15.50	14.50
No. 2 Southern, Cin'ti	**17.75**	17.61	16.51	13.82
No. 2, Birmingham	13.00	13.00	12.00	11.00
No. 2 foundry, Chicago*	17.00	17.00	16.00	15.50
Basic, del'd eastern Pa.	17.09	17.09	16.09	14.50
Basic, Valley furnace	16.00	16.00	15.00	13.50
Valley Bessemer, del'd P'gh.	18.89	18.89	17.89	16.89
Malleable, Chicago*	17.00	17.00	16.00	15.50
Malleable, Valley	16.50	16.50	15.50	14.50
L. S. charcoal, Chicago	23.17	23.17	23.17	23.17
Ferromanganese, seab'd car lots	82.00	82.00	82.00	68.00

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$40.00	$40.00	$40.00	$43.00
Light rails at mill	30.00	30.00	30.00	32.00
Rerolling billets, Pittsburgh	26.00	26.00	26.00	26.00
Sheet bars, Pittsburgh	26.00	26.00	26.00	26.00
Slabs, Pittsburgh	26.00	26.00	26.00	26.00
Forging billets, Pittsburgh	31.00	31.00	31.00	33.00
Wire rods, Pittsburgh	35.00	35.00	35.00	37.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.60	1.60	1.60	1.60

Finished Steel

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.60	1.60	1.60	1.60
Bars, Chicago	1.70	1.70	1.70	1.70
Bars, Cleveland	1.65	1.65	1.65	1.65
Bars, New York	1.95	1.95	1.95	1.95
Tank plates, Pittsburgh	1.60	1.60	1.60	1.60
Tank plates, Chicago	1.70	1.70	1.70	1.70
Tank plates, New York	**1.898**	1.598	1.598	1.898
Structural shapes, Pittsburgh	1.60	1.60	1.60	1.60
Structural shapes, Chicago	1.70	1.70	1.70	1.70
Structural shapes, New York	1.86775	1.86775	1.86775	1.86775
Cold-finished bars, Pittsburgh	1.70	1.70	1.70	1.70
Hot-rolled strips, Pittsburgh	1.60	1.60	1.60	1.45
Cold-rolled strips, Pittsburgh	2.25	2.25	2.00	2.00

Finished Steel

Per Lb. to Large Buyers:	Aug. 1, 1933 Cents	July 25, 1933 Cents	July 5, 1933 Cents	Aug. 2, 1932 Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.25	2.25	2.25	2.20
Hot-rolled annealed sheets, No. 24, Chicago dist. mill	2.35	2.35	2.35	2.30
Sheets, galv., No. 24, P'gh	2.85	2.85	2.85	2.85
Sheets, galv., No. 24, Chicago dist. mill	2.95	2.95	2.95	2.95
Hot-rolled sheets, No. 10, P'gh	1.65	1.65	1.65	1.55
Hot-rolled sheets, No. 10, Chicago dist. mill	1.75	1.75	1.75	1.65
Wire nails, Pittsburgh	2.10	2.10	1.85	1.95
Wire nails, Chicago dist. mill	2.15	2.15	1.90	2.00
Plain wire, Pittsburgh	2.10	2.10	2.10	2.20
Plain wire, Chicago dist. mill	2.15	2.15	2.15	2.25
Barbed wire, galv., P'gh	2.60	2.60	2.35	2.60
Barbed wire, galv., Chicago dist. mill	2.65	2.65	2.40	2.65
Tin plate, 100 lb. box, P'gh	$4.25	$4.25	$4.25	$4.75

Old Material

Per Gross Ton:				
Heavy melting steel, P'gh	$13.75	$13.75	$11.75	$8.00
Heavy melting steel, Phila	11.75	11.75	10.00	6.25
Heavy melting steel, Ch'go	10.75	10.75	9.87½	5.25
Carwheels, Chicago	10.50	10.50	9.50	5.50
Carwheels, Philadelphia	12.75	12.75	10.25	8.00
No. 1 cast, Pittsburgh	11.75	11.75	10.50	9.50
No. 1 cast, Philadelphia	12.50	12.50	10.25	8.00
No. 1 cast, Ch'go (net ton)	10.50	10.50	8.75	6.00
No. 1 RR. wrot., Phila	12.00	12.00	10.75	8.50
No. 1 RR. wrot., Ch'go (net)	9.00	9.00	6.50	3.75

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$2.50	$2.50	$2.00	$2.00
Foundry coke, prompt	3.00	3.00	2.75	3.00

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Electrolytic copper, refinery	8.75	8.75	8.25	5.00
Lake copper, New York	9.00	9.00	8.50	5.37½
Tin (Straits), New York	44.25	46.87½	46.50	21.75
Zinc, East St. Louis	5.00	5.00	4.50	2.75
Zinc, New York	5.37	5.37	4.87	3.12
Lead, St. Louis	4.35	4.35	4.15	2.85
Lead, New York	4.50	4.50	4.30	2.95
Antimony (Asiatic), N. Y.	7.25	7.50	6.50	5.00

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

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▲▲▲ The Iron Age Composite Prices ▲▲▲

	Finished Steel	Pig Iron	Steel Scrap
Aug. 1, 1933	1.973c. a Lb.	$15.94 a Gross Ton	$12.08 a Gross Ton
One week ago	1.973c.	15.90	12.08
One month ago	1.973c.	15.01	10.54
One year ago	1.976c.	13.76	6.50
	Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products make 85 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1933	1.973c., July 5;	1.867c., Apr. 18	$15.94, Aug. 1;	$13.56; Jan. 3	$12.08, July 25;	$6.75, Jan. 3
1932	1.977c., Oct. 4;	1.926c., Feb. 2	14.81, Jan. 5;	13.56, Dec. 6	8.50, Jan. 12;	6.42, July 5
1931	2.037c., Jan. 13;	1.945c., Dec. 29	15.90, Jan. 6;	14.79, Dec. 15	11.33, Jan. 6;	8.50, Dec. 29
1930	2.037c., Jan. 13;	2.018c., Dec. 9	18.21, Jan. 7;	15.90, Dec. 16	15.00, Feb. 18;	11.25, Dec. 9
1929	2.317c., April 2;	2.273c., Oct. 29	18.71, May 14;	18.21, Dec. 17	17.58, Jan. 29;	14.08, Dec. 3
1928	2.286c., Dec. 11;	2.217c., July 17	18.59, Nov. 27;	17.04, July 24	16.50, Dec. 31;	13.08, July 2
1927	2.402c., Jan. 4;	2.212c., Nov. 1	19.71, Jan. 4;	17.54, Nov. 1	15.25; Jan. 11;	13.08, Nov. 22

Pittsburgh Steel Rate Is Off Slightly

Demand Remains in Good Volume But Operations Are Threatened by Labor Difficulties in Coke Region

PITTSBURGH, Aug. 1—Specifications for both light finished steel and heavy hot-rolled products at the month-end were in good volume. Releases on the latter were naturally influenced to some extent by the desire of consumers to take advantage of old low-priced contracts, against which specifications had to be placed by July 31.

With sheet mills still actively engaged on backlogs, the movement of sheet bars is fairly steady. Bars and plates are also in good demand. Placing of contracts last week for 18 Navy vessels is expected to benefit local mills with a considerable tonnage of heavy armor and deck plate. About 7000 tons of stainless steel is also expected to be specified for these ships.

While structural shapes are momentarily quiet, prospects for this product are brightened by the prospective placing of more than 900 Government projects, including post offices and other structures, which will require approximately 160,000 tons. These projects have already been officially authorized but await final granting of appropriations. Reinforcing bars are rather neglected. Although 22 States are reported to have already obtained Federal approval of funds for road building, contracts for this work are not expected to be awarded in time to benefit local makers of reinforcing bars with heavy tonnage before next spring.

Finished steel requirements of the automotive industry show no definite signs of early diminution, although further specifications will not unlikely reflect caution on the part of that industry in meeting higher prices on full finished sheets now generally in effect; at least until the price situation becomes clarified upon the prospective establishment of the steel code. Further favorable reports on the fruit crop have improved the immediate outlook for tin plate demand. Tin plate backlogs are still being extended by restriction of operations to 16 turns, and, in addition, by the continued hot weather which has hampered operations.

Steel ingot production in the Pittsburgh district is slightly lower at 49 per cent of capacity, a few openhearths having been taken off at scattered plants. No additional blast furnaces have been lighted. Steel operations in the Valleys and nearby northern Ohio are unchanged at 65 per cent of capacity. Output in the Wheeling district is off five points to 85 per cent.

Labor disturbances in the coke region have presented a serious problem to pig iron producers and to the steel industry itself. Unless early settlement of strikes is reached, a coke shortage is considered a certainty.

Pig Iron

Producers face a serious problem as a result of labor disturbances in the coke regions. With shipments of furnace coke practically halted by strikes, furnaces may be confronted with a fuel shortage if difficulties in the coal territory are not overcome within a short time. Few blast furnaces have built up large stocks of coke, and, if pig iron operations are interrupted by lack of fuel, some users of steelmaking iron will probably have to enter the market for basic. Merchant sellers report no change in the character of demand from foundries, which are generally well covered through the third quarter and are accepting deliveries at contract rates. Prices are notably strong. If coke values rise as an outgrowth of possibly higher wages at coking coal operations, pig iron prices may be adjusted upward in line with such increased costs.

Semi-Finished Steel

Shipments of billets, slabs and sheet bars held up fairly well toward the month-end. The $26, Pittsburgh or Youngstown, price is well maintained. Wire rods are still in good demand and quotably unchanged at $35, Pittsburgh or Cleveland. Forging billets are also moving steadily at $31, Pittsburgh.

Bars, Plates and Shapes

Specifications for heavy hot-rolled products increased perceptibly during the final week in July, which marked the deadline for deliveries against old low-priced contracts. Bars and plates were particularly in demand. The placing of contracts for 21 Navy vessels will undoubtedly bring to local mills considerable tonnage of heavy armor and deck plate. Although structural material is relatively quiet, the prospects for this class of steel are brightened by the Government rehabilitation program now taking shape. More than 900 projects on this program, involving post offices and other Government buildings that will require an average of 100 tons each of structural shapes, have already been officially sanctioned, but appropriations have not yet been granted on individual projects. This construction work, according to early estimates, will require approximately 160,000 tons of steel. The American Barge Line, Inc., has placed five barges, requiring 1300 tons of plates, with the American Bridge Co. There is not much active inquiry in the barge market, but yards are fairly well engaged on old orders. Demand for reinforcing bars still hinges on release of Government road contracts, which now apparently will not be definitely lined up in time to benefit local makers with heavy tonnages before next spring.

With releases against old contracts cleaned up, the 1.60c., Pittsburgh, price on bars, plates and shapes will be rigidly adhered to on and after Aug. 1.

Rails and Track Accessories

The price of steel tie plates has been advanced $3 a ton to a basis of 1.90c. a lb., Pittsburgh, for delivery not later than Sept. 30. The base price applies to 20 tons or more. On lots of 10 to 19 tons, a premium of $3 a ton will apply; 5 to 9 tons, $6; 2 to 4 tons, $15, and 1 ton, $40. The discount of 73 per cent off list for track bolts in lots of 100 has been reaffirmed for shipment during the remainder of the third quarter.

Tubular Goods

Boiler tubes and mechanical tubing still are the only fairly active tubular products. Oil country goods and line pipe are rather neglected. Standard butt-weld pipe, which recently enjoyed an improved demand, is now rather quiet.

Cold Finished Steel Bars

The price has been advanced $5 a ton, for shipment during the remainder of the third quarter, to bases of 1.95c. a lb., Pittsburgh; 2c., Chicago, Cleveland and Buffalo; 2.15c., Detroit, and 2.20c., delivered eastern Michigan. The base prices at Detroit and eastern Michigan are only established temporarily and will be withdrawn when prices are established under the steel code. The new price is $7 a ton over the base price of hot-rolled bars as compared to $2 heretofore, but cold finishers are now required to pay the full price of 1.60c., Pittsburgh, while previously they have enjoyed the usual $2 a ton concession to large buyers. In addition, producers of hot-rolled bars are now quoting cold finishing mills on an f.o.b., makers' plant, basis, as against a former policy of quoting delivered prices for consumers in the Pittsburgh switching district. The switching charge amounted to 80c. to $1 a ton.

General increases in wages and material costs will probably absorb the remaining $2 in the $5 a ton advance. Prior to the advance, bookings increased measurably, and July business ran about 20 per cent ahead of that booked in June.

Wire Products

Heavy specifications against old low-priced contracts marked the final week in July. The evident desire of consumers to take advantage of low prices before the deadline on July 31 helped to swell July deliveries, which ran about 25 per cent ahead of those in June. The automotive industry was the most active taker of manufacturers' wire and spring wire. New bookings at the recently advanced prices on merchant wire products are meager. Manufacturers of road mesh expect to participate soon in tonnage required for Government road work. Twenty-two States have already received Federal approval of loans for such work, and first bids for welded road mesh will be opened in New York, Aug. 11.

Sheets

Releases continue to be heavy, with specifications from the automotive industry particularly well sustained. Although production at some mills is gaining ground on backlogs, other producers are still comfortably fixed with commitments that will carry operations at the present rate well into September. Production is well sustained at 55 to 60 per cent of capacity. Hot-rolled and annealed sheets for the beer barrel makers still are in active demand. Extremely hot weather has further slowed up shipments of wide cold-rolled sheets, in some cases having delayed loading a week. Although auto body and steel furniture sheets are generally quotable at 2.60c., Pittsburgh, which will not probably be established until acceptance of the steel code, 2.30c. is still being done. Galvanized and hot-rolled annealed sheets are well established at 2.85c. and 2.25c., Pittsburgh, respectively.

About 7000 tons of stainless steel sheets is expected to be specified for the 21 Navy vessels on which bids were taken last week.

Bolts, Nuts and Rivets

The July prices have been reaffirmed for the remainder of the third quarter. Bolts and nuts are quoted at 73 per cent off list, and large rivets at $2.50, base per lb., Pittsburgh or Cleveland.

Tin Plate

Specifications are holding up surprisingly well, and no immediate diminution of demand is in sight. Further favorable reports on the fruit crop augur a larger pack than previously expected, and tin plate requirements are consequently expected to be well maintained through the greater part of August. Although continued hot weather has hampered operations to some extent, mills have managed to maintain an average operating rate of around 95 per cent. Some interest has been manifested in fourth quarter tin plate, but mills are reluctant to commit themselves for such business.

Strip Steel

Mills are still actively engaged on backlogs, but new business is lagging. Operations in July, on a tonnage basis, averaged somewhat better than those in June. Releases from the automotive industry still account for the bulk of current movement. Manufacturers of cash registers and hardware lines are also taking a fair share of strip steel. The 1.60c., Pittsburgh, price on hot-rolled strip has practically disappeared, and the market is now apparently established at 1.65c., Pittsburgh, for delivery through the third quarter.

Coke and Coal

The shortage of furnace coke that has attended growing labor disturbances at bituminous mines in nearby districts is becoming acute. Virtually no furnace coke is available. Consumers, on the other hand, are actively seeking to purchase, with the result that prices have stiffened perceptibly. In the absence of sales, however, quotations are nominal at recent levels. Users of furnace coke are particularly anxious to obtain tonnages in order to replenish rapidly dwindling stocks. Appearance of any offerings would likely establish considerably higher prices for that grade of fuel. Coal prices, in the absence of transactions, are also nominally unchanged.

Scrap

The scrap market is without feature, with prices firm and unchanged.

Absence of mill purchases in the past week has precluded any change in prices through the list. No. 1 heavy melting steel is nominally held at the recently advanced level of $14. Although the market is unchanged, practically all grades are termed strong. Dealers' bids are failing to uncover much tonnage, and, according to some brokers, higher prices will probably be necessary to bring out sizable quantities. The monthly list of the Pennsylvania contains 15,000 tons, while the Baltimore & Ohio is offering 1500 tons of No. 1 steel.

Buffalo Counts on Public Works Program

BUFFALO, Aug. 1.—The pig iron business is quiet with an occasional inquiry for a carload lot and even 100 and 200 tons, but in the main, inquiry has dropped off with most users covered for their expected requirements. Shipments continue in good volume.

Steel

Operation of open-hearth furnaces at the Lackawanna plant of the Bethlehem Steel Corpn. has dropped from fifteen to twelve, but Republic Steel Corpn. has increased from five to seven open-hearths and from present indications will add an additional furnace the latter part of this week. Wickwire-Spencer Corpn. is operating two open-hearths and Seneca sheet division of Bethlehem is operating 70 to 75 per cent. Wire business is very good and with the large program of public work in sight, this is expected to be heavily increased. A local fabricator of structural has the contract for 175 tons of tank plates for grain hoppers at the Eastern States Milling Co., Buffalo. Warehouse buying has been conservative, indicating substantial buying in the fall. A perceptible improvement has occurred in warehouse bar and sheet business.

Scrap

The market is marking time. The larger mills have satisfied their requirements for the time being. A sale of railroad malleable is reported at a nearby consuming point at $13.50, delivered. This makes the price Buffalo $12 to $12.50. Some small stove plate orders have been taken at $9.25. Some sales of Buffalo scrap are being made at Youngstown, in new and old hydraulic compressed sheets. Heavy receipts of boat scrap is a factor in keeping the largest consumer out of the market.

Boulder Dam Towers Feature Coast Bookings

SAN FRANCISCO, July 31.—The Los Angeles Bureau of Water and Power has awarded contracts for 28,000 tons of structural steel for towers for the 270-mile transmission line from Boulder Dam to the city. Tower Builders, Inc., a specially organized company, took approximately 23,000 tons while McClintic-Marshall Corpn. took 5000 tons. Judson Mfg. Co. was awarded 425 tons of plates and bars for the San Francisco county jail. These two projects required the major part of the tonnage reported as awarded for the week, totals of which were 28,710 tons of structural, 481 tons of reinforcing and 300 tons of plates.

New inquiries for the week have been few, with but 742 tons of structural and 1270 tons of bars being reported. The Los Angeles Bureau of Water and Power has taken bids on 1108 tons of bars. With an absence of governmental projects, activity continues to be confined to industrial and private jobs of small tonnages. Both mill and warehouse prices remain unchanged with little or no tendency to become firmer.

Chicago Output Recedes to 52 Per Cent

Generous Bookings, However, Indicate that Decline Has Been Checked—Price Policy on Plates, Shapes and Bars Undetermined

CHICAGO, Aug. 1—Ingot output has receded several more points and now stands at 52 per cent of capacity. Indication that this may be the end of the downward movement for the present is given by the fact that both new sales and fresh specifications are the highest for any week so far this year.

The first of August has arrived and there are no stated policies as to prices for plates, shapes and bars except that present quotations will be unaltered while business is done on a day-to-day basis. The termination of the iron and steel code hearing will probably bring an announcement of price policies. In the meantime there is some support here for a movement to eliminate the differential between Chicago and Pittsburgh on plates, shapes and bars.

On the whole, business is well diversified. The building industry is giving little support, but public works should bring in tonnage in the near future. Tank work is spotty, with little change in the aggregate tonnage, while releases of steel for use in railroad shops are growing. Railroad bridge steel is in light demand, being confined to a few small repair jobs. Agricultural implement manufacturers appear to have made no material gains in output in recent days, but they are showing more interest in prices and it is quite probable that this group will use more steel before the end of the month.

The scrap market, while marking time, seems quite definitely to be on the strong side.

Pig Iron

This market remains on an even keel except for the fact that the output of some foundries is beginning to waver. Prices for silvery iron and Bessemer ferrosilicon are being marked up sharply. The 8 per cent silicon grade is now being quoted $23.25 a ton, f.o.b. furnaces.

Cast Iron Pipe

The cast pipe market remains quiet notwithstanding that many municipalities have projects on which Government aid is expected. As a usual thing current expenditures on these projects are held very low. Usually only sufficient preliminary engineering work is done to request a loan. Complete engineering and drafting work will be performed when the money is actually made available. Prices are strong and advances are expected by the trade.

Reinforcing Bars

The State of Illinois has adopted the new road slab design which calls for 6 tons of bars per mile instead of 10 tons. However, more strips will be used. The increased cost of building roads accounts in large part for the relative inactivity in this State. Shipments against old contracts for Illinois road and bridge work are in good volume and deliveries will soon increase in Indiana where new work is now being let. A store building in Chicago is the first job of its kind and size in many months. Prices are firm.

Sheets

Extremely hot and humid weather has hampered hot mill output. Demand is comparatively steady and prices are holding. Little change is noted in consumption by automobile manufacturers, and the container group is maintaining a very satisfactory rate of output.

Rails and Track Supplies

Chicago mills are limping along with only an occasional release against an old rail order. Weeks have passed since a new order has been entered and prospects are not bright for the immediate future. Sellers lean toward the opinion that this market has little chance to revive until the coordinator at Washington has working plans more fully developed. For the first time in many weeks specifications for track supplies are heavier. Light rails are in very small demand.

Plates

Heavy support to the plate market is lacking but miscellaneous business is in encouraging volume. Here and there is an order for an oil storage tank, and those fabricators who had business from breweries are still busy on old orders and are finding some new tonnage available. On the whole tank fabricators are far better off in the way of ship schedules than are the bridge shops. Railroad shops are taking more steel. The Wabash has been authorized to spend over $350,000 for conversion and repair of box cars at its Decatur, Ill., shops. Reports from other railroads indicate that shop employment is slowly but steadily increasing. There are repeated reports of difficulty in supplying the particular car needs of some shippers.

Structural Material

Awards total only a few hundred tons and fresh inquiries are unusually low. Bids are being taken on a few small and scattered post offices but only one of the larger jobs tributary to this territory is up for figures. Bids will be taken Aug. 10 on the 1000 tons needed for the Des Moines post office. Several small grade separation jobs account for most of the business from railroads, which instead of doing any extensive bridge work are confining orders for a few tons at a time for minor repair work.

Bars

Prices for bar mill products, as well as for plates and shapes, are firm and with the opening of August all business is being done on a day to day basis. The last price policy established was for the month of July but, with the steel code hearings going on in Washington, sellers are unwilling to take a firm stand for as far ahead as the end of August. Agricultural implement manufacturers are still comparatively quiet though in recent days they have shown more interest in prices, and it is the common belief that real manufacturing schedules will be established in August. There is no lowering in the rate of bar use by automobile plants.

Wire Products

Output has dropped about 5 points to 55 per cent of capacity, a change that is not so severe as is often experienced at the turn of August. General manufacturing and automobile plants are taking about 10 per cent less tonnage and use of wire and wire products in the farm areas is out of season. Continued hot and dry weather throughout the Central West is causing serious damage to crops. Prices are firm on a moderate volume of sales.

Coke

Some sellers of foundry coke made outside of Chicago are advancing prices 50c. a ton. Local ovens still adhere to $7.50 a ton.

Scrap

Practically the entire price structure remains stationary while buyers and sellers alike study the situation. Railroads are receiving $10.50 to $11 a ton, delivered, for supplies of heavy melting steel. At the same time several mills have slowed down on acceptances. A cargo of heavy melting steel left Chicago Saturday for Cleveland and borings are being accumulated for a boat movement. Cast wheels are unusually quiet, demand having been upset by the receipt of water shipments at Chicago. Opinions as to the course of prices differ though most dealers believe it will be upward.

Steel Output Rises Sharply in Eastern Pennsylvania

Ingot Rate Now 47 Per Cent of Capacity — Month-End Specifications Large—Pig Iron Shipments Heavy

PHILADELPHIA, Aug. 1.—Steel ingot production in the eastern Pennsylvania district has risen six points to 47 per cent of capacity. Some producers in this territory have sufficient business on hand to continue operating at present rates through the month of August. The increase in output during the past week reflects a gain in specifications for products on which prices were extended until July 31, together with a gradual broadening of industrial activity. Conspicuous among the month-end releases were orders for plates, bars and wire products. There was also a moderate increase in specifications for structural steel, indicating that jobbers and fabricators laid in extra supplies to the extent that was practicable.

Tin plate releases are in unabated volume, and both tin mills and wire plants are running at capacity. Sheet demand has not been up to June levels, but district sheet production ranges from 50 to 80 per cent of capacity.

The last of the price advances on major finished steel products are effective today. The new price policy, under which "preferentials" become a thing of the past, has already brought out sharp protests from larger buyers. The contention is made that the steel code does not bar lower prices to tonnage consumers, but merely requires that such quotations be made public. It is also argued that until the code is formally accepted by the Recovery Administration, it is not official and hence requires no immediate departure from time-honored trade practices. Mills, however, seem determined to adhere rigidly to the new price levels. They feel that advances are fully justified not only because of recent wage increases, but also because of labor troubles in the coal fields, which are driving fuel costs sharply upward.

Pig Iron

Most buyers are covered for the third quarter and business at the new prices is therefore limited to comparatively small lots. Shipments, however, are heavy, in the case of one producer being the largest for any month since 1929. Improvement in deliveries is partially a reflection of increasing melt. Average foundry operations are now estimated at 40 per cent of capacity as compared with 25 to 30 per cent two or three months ago. Demand for castings is becoming more diversified, and in some instances melters are anticipating orders against their contracts. Large orders for steel castings are expected to follow the award of contracts for 21 naval vessels on which the Government took bids July 26. This will increase the demand for low phosphorus iron and may lead the Delaware River furnace to resume production. Prices on low phosphorus pig iron are unchanged, not being covered in the iron and steel code. The Brooke furnace at Birdsboro, Pa., may go into blast soon.

District melters hope to participate in the prospective distribution of 24,000 tons of cast iron pipe by the city of Cleveland.

Prices of silvery iron have been advanced from $1.25 to $9.25 a ton, depending on the silicon content. Concomitant advances on Bessemer ferrosilicon range from $3.25 to $10.25 a ton.

Reinforcing Bars

Current demand is light. Both Pennsylvania and New Jersey have applied for Government funds to finance road building programs, but it is unlikely that bids can be taken before Aug. 25, at the earliest. This will leave only September and October, and possibly part of November, for construction work.

Plates, Shapes and Bars

A bulge in specifications for plates and bars, and to a lesser extent for structural shapes, preceded the "deadline" for the acceptance of business at quotations held over through the month of July. However, the rush to specify is only partly responsible for recent improvement in demand. There has also been a broadening of industrial activity, which is reflected in the growing requirements of boiler and tank shops and miscellaneous consumers generally. Railroad purchases continue to expand slowly. The Baltimore & Ohio, which took bids last week on car repair parts requiring 2000 tons of plates, is expected to place the orders shortly.

The biggest thing on the horizon is the Government's naval program. Low bidders have been announced on 21 vessels, requiring 45,000 tons of steel, and prompt awards are expected in view of the Administration's evident desire to expedite the reemployment movement.

With the passing of Pencoyd, Pa., as a separate basing point on structural shapes, delivered prices at Philadelphia are automatically increased 6.60c. per 100 lb. which represents the difference between the freight rates from Pencoyd and from Bethlehem. The advance on plates to 1.70c., Coatesville, also becomes effective today. Steel bars remain at 1.60c., Pittsburgh.

Warehouse Business

Bookings in July were not as large as those of June. Apparently buyers anticipated their needs somewhat in placing orders during the earlier period. An early advance in warehouse quotations on cold-finished bars is a possibility.

Sheets

Demand has tapered, and it is evident that July bookings fell considerably short of those of the previous month. Some users, however, are increasing their operations. Manufacturers of gas stoves are particularly busy, although experiencing operating difficulties in some cases as a result of the intensive unionization drive by organized labor.

Imports

The following iron and steel imports were received here last week: 8500 tons of manganese ore from British West Africa; 6314 tons of pig iron and 50 tons of ferromanganese from the Netherlands; 112 tons of structural shapes, 53 tons of steel bars and 37 tons of steel bands from Belgium; 37 tons of steel bars and 4 tons of steel bands from France; and 15 tons of steel bars and 9 tons of steel bands from Germany.

Scrap

Prices are unchanged but firm. Foreign buying of scrap in this market has ceased, although Japan is still taking shipments against old commitments.

The South Waiting on Recovery Act Outcome

BIRMINGHAM, Aug. 1.—Pig iron shipments in July were the best in about two years. There was a steady movement throughout the month. The current melt of the foundries did not absorb all of the iron and part of it was for stocks. Just prior to the price advance on July 10, foundries bought liberally for the third quarter and during the month they began to rebuild their yard stocks. Current sales are light, as most foundries are now covered and the furnaces are not willing to sell at this time for the fourth quarter. They are marking time pending further developments of the Industrial Recovery Act.

The sluggish condition of the pressure-pipe industry still persists. July

shipments, operations and bookings were only slightly different from June. This has been one of the bleakest summers that Birmingham pipe has experienced in many years. Its present outlook is almost wholly dependent on Government financial projects, and these are still slow in taking shape.

Since the early part of the month, nine furnaces have remained active stacks, four on basic iron, four on foundry and one on recarburizing. Republic Steel will blow in another furnace within the next week or ten days. This furnace was scheduled for resumption around Aug. 1, but there was a delay in securing the new top.

Steel

Steel bookings show a recession, owing to the small amount of business in railroad and heavier products. Demand for lighter products has been maintaining an even rate and is about the same as in June. July shipments exceeded those of June, but total new buying was less. Active demand of the latter part of June sustained July shipments. Thirteen open-hearth furnaces operated last week, the same as the preceding week.

Car-Repair Steel Bought in St. Louis

ST. LOUIS, Aug. 1.—The bulk of the pig iron that will be required for the remainder of the third quarter in the St. Louis industrial district has been bought, and buying now is only of comparatively small lots of special analyses to fill in. However, shipments against contracts have been at an almost unprecedentedly high rate. Almost without exception, melters are ordering out all iron purchased on contracts. The market continues exceedingly firm, and prices are unchanged.

Open-hearth operations in St. Louis are at about 37 per cent of capacity. Kansas City and Peoria each is operating all of its three furnaces.

The Wabash Railway purchased parts requiring 1500 tons of shapes and plates for repair of 300 freight cars in its shops at Decatur, Ill., from the American Car & Foundry Co.

The reinforcing bars, 325 tons, and shapes, 100 tons, for the administration building of the city negro hospital have been awarded to the Laclede Steel Co. and the Columbia Iron Works, respectively. There has been some buying of structural material for stock; otherwise the situation is quiet.

During the week, an East Side melter bought approximately 5000 tons of heavy melting steel, and a St. Louis melter bought a limited tonnage of this material. The market is very firm at unchanged prices. Wabash Railway has a list of 10,000 tons, and the Missouri-Kansas-Texas of 1000 tons.

Better Heavy Steel Bookings at New York

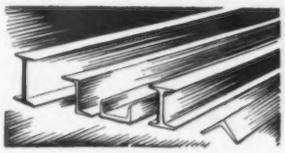

Plate Prices Higher—Wire Business Improving — General Marking of Time Until Steel Code is Settled

NEW YORK, Aug. 1.—Conditions have not materially changed from those ruling a week ago. While the volume of new business in finished steel has been large, a slight falling off for July from June is indicated. One large company places its July business at about two-thirds that for June. One reason, often repeated, for the slight decline is that both producers and consumers are waiting for the outcome of the code hearings which started yesterday in Washington and in which there is keen interest. On the results much depends as to the future of the market, many contend.

Sellers dominate the market with prices unchanged and steady. Any requests for price shading have been promptly turned down. Producers are limiting purchases to Sept. 15 with deliveries permissible to the end of the third quarter. Eastern plate prices were advanced today to 1.70c., Coatesville, but new business at this level has been light. New orders at the old quotations as well as specifications have been heavy, not only for plates but also for bars and shapes. There has also been some good buying of bars, plates and shapes for railroad car repairs. New business in wire rods and wire products has also been satisfactory. Rumors of price advances in these products persist with no definite information available. Mill stocks of many products have practically disappeared and delivery dates are being advanced by some manufacturers.

Tin plate still is active. New business and specifications continue in large volume. Expectations of price advances for the fourth quarter continue positive but there have been no decisions made public if any have been reached. One producer is refusing business because bookings cover the entire third quarter.

In this district disappointment persists in the absence of sizable orders for structural steel for building projects and for rails, for that matter. Many sellers, however, are expecting developments in these lines by fall, especially when Government projects are definitely launched.

Pig Iron

Prices are quotably firm for shipment throughout the quarter. The price structure continues somewhat obscure, with complete clarification dependent upon code acceptance and interpretation. Furnaces are showing no disposition to discuss fourth quarter needs until codification becomes a reality. Releases are heavy, and many melters are specifying well in advance of contract schedules. Large consumers are generally well covered for third quarter. Fill-in orders from jobbing foundries constitute the major portion of fresh buying, although speculative tonnages are being taken by several well financed melters. Bookings for the past seven-day period aggregated 3400 tons, compared with 2500 tons the preceding period and 4500 tons two weeks ago. Abetted by more stable exchange values, foreign brands are enjoying an increased consumer interest at shaded price levels.

Reinforcing Bars

Dealers are making moderate sales at the quoted Pittsburgh base prices of 1.60c. for mill lengths and 1.75c. a lb. for cut lengths. Complete withdrawal of concessions, which on occasions have approached $2 a ton, cannot be indicated, since prices have received no recent tests under pressure of sizable tonnage. Miscellaneous New Jersey and New York highway improvements, together with 150 tons for a Brooklyn warehouse, constitute awards for the week. New York State will open proposals Aug. 11 covering 2000 tons of mesh and bars required for a score of bridge and highway developments. In addition, private projects in New Jersey, aggregating over 200 tons, will be placed within the next week.

Scrap

Market demand has eased off, and price advances have been sharply curtailed. Consumers and dealers alike are withholding extended activity in order to critically examine the price structure with regard to consumer demand and the material available. Yards are releasing considerable quantities of metal at current price levels. Brokers are covering present orders, but display little interest in heavy future commitments. Recent sales advanced No. 1 machinery cast $1 a ton to $11. Forge fire is moving at $6, and foundry stove plate at $6.50 a ton, barge. A sizable tonnage of specification iron and steel pipe was placed

yesterday at $5 a ton. Foreign inquiry continues heavy and diversified, although export loadings are only in moderate volume. Japanese melters recently purchased a good tonnage of rails at a price well above domestic quotations.

Pig Iron Shipments on Increase in Cincinnati

CINCINNATI, Aug. 1.—Orders for pig iron in the past week dwindled to about 300 tons for immediate use. Shipments, on the other hand, have shown a steady increase, bringing the July level above that of June. Some uncertainty prevails in the district market over the effect of the blanket code in the absence of an acceptance of the proffered steel code. The chief center of difficulty is the question of fixed-price contracts. Furnace representatives report consumer nervousness over the possibility of price increases on fixed-quotation commitments. Foundry activity continues at good pace, although machine-tool melters are still without noticeable business. Except for two 100-ton inquiries for Southern iron, pending business is negligible.

Coke

Reflecting the steady melt, coke shipments continue to be good. New business is limited to occasional small transactions.

Warehouse Business

The usual seasonal influences have failed to affect the district jobbers' market. Ordering from industrial sources continues at good rate. Quotations on No. 24 gage galvanized sheets were advanced to 4.15c. the past week.

Steel

Sheet demand tapered in the past week, despite the fact that consumers are not carrying appreciable inventories. Operations, however, will continue at about 75 per cent of capacity in an effort to reduce present backlogs. Prices are steady and while no guarantees are given, mills are accepting specific tonnage orders at the present rates for delivery over the remainder of the current quarter.

Scrap

While the old materials market is strong, the absence of trading activity is the most noticeable feature. Dealers, wary of short sales, are manuevering themselves into safe position to watch the trend of the market. Prices continue to be firm, but unchanged.

New York Central Railroad has purchased six 300-amp. arc welders from General Electric Co., Lincoln Electric Co. and Westinghouse Electric & Mfg. Co.

Heavy Bar Specifications in Cleveland District

July Bookings Approach Those of June—Steel Output Averages 69 Per Cent—Blast Furnace Resumption Delayed by Coal Situation

CLEVELAND, Aug. 1—The rush of users of steel bars to place orders at the old price prior to readjustment to a basis of 1.65c., Cleveland, effective today, has resulted in heavy specifications in the last few days. In fact, this tonnage has been so substantial that in the case of one mill the volume for July will almost equal that for June, and a local district office of a leading steel company reports July bookings twice those of June. In connection with this bar tonnage, consumers are agreeing to take delivery not later than Aug. 31.

Ingot operations in the Cleveland-Lorain district this week stand at 69 per cent. The National Tube Co. has put on an additional furnace, making a total of 12 active furnaces, while the Otis Steel Co. has taken off another furnace. Corrigan McKinney Steel Co., which is operating three blast furnaces, has a fourth furnace ready to blow in, but will not light it until the coal situation clears up.

The demand for wire products and strip steel has been brisk, with the past month's tonnage showing a gain of over 25 per cent compared with June. Prices in general are acquiring additional strength, especially as it becomes increasingly evident that, under the industrial recovery program, the cost of making steel will be materially higher.

Pig Iron

Consumers are specifying liberally against current contracts, and it appears that shipments in August will not fall far below those in July, which was by far the best month of the year. However, there is little inclination on the part of users to make fresh commitments until the trend of events as affected by the National Recovery Act is clarified. The tonnage moving to the automotive trade is large. Jobbing foundries are requiring more iron as their business picks up. Prices are firm.

Bars, Plates and Shapes

Specifications have been fairly good and have come largely from a miscellaneous run of consumers. The fact that a growing number of users in various diversified lines of industry are coming into the market for small tonnages is an augury of a healthier condition than has existed for some time. There still is a notable absence of structural activity, but the volume of business from railroads for repair work has taken an encouraging upward trend. Bars are now firm at 1.65c., Cleveland, while structural shapes and plates are quoted at 1.60c., Pittsburgh.

Bolts, Nuts and Rivets

The increase in business from railroads is a feature of the market. Manufacturers also state that bookings are more diversified than at any other time this year. Orders for rivets in July were almost as large as those in June, although the latter month's tonnage was stimulated by last-minute specifications preceding the price advance on July 1.

Strip Steel

Large consumers, particularly those in the automotive trade, are pushing for quick delivery of both hot and cold-rolled strip steel. Incoming business is of fair volume. Hot-rolled strip is steady at 1.60c. to 1.65c., Pittsburgh.

Sheets

Specifications have held up surprisingly well, with business coming from a variety of sources. Electric refrigerator manufacturers are continuing to take steel in good volume, while the tonnage from grave vault builders has been of sizable proportions. A substantial share of orders is still originating in the automobile industry, which is operating at a high rate. There is a tendency in some quarters to shade prices, particularly of hot-rolled annealed sheets, but the recently established quotations are showing increasing strength.

Scrap

With steel mill operations tapering, the demand for scrap has relaxed and one large Valley maker has requested temporary suspension of shipments. Another steel company in the Valley is taking in considerably less scrap, while local steel producers have plentiful stocks on hand. However, prices are being firmly maintained. Dealers are anticipating a quiet market during the next two weeks.

Fabricated Structural Steel

Awards in Good Volume—New Projects Decline

INCLUDING 28,000 tons for the Bureau of Water and Power, Los Angeles, for towers from Los Angeles to Boulder Dam, lettings for the week totaled 33,135 tons, the third largest for any corresponding period this year. New projects of 7000 tons compare with 8000 tons last week and 8550 tons two weeks ago. The largest inquiry reported is 1000 tons for a post office in Des Moines, Iowa. Contracts in July totaled 48,250 tons, compared with 65,850 tons in June and 150,085 tons in May. Structural steel lettings for the week follow:

NORTH ATLANTIC STATES

Everett, Mass., 200 tons, Boston & Maine Railroad bridge, to Boston Bridge Works, Inc.

New York, 730 tons, Jewish Memorial Hospital, to A. E. Norton, Inc.

Cheektowaga, N. Y., 780 tons, D. L. & W. Railroad crossing elimination, to American Bridge Co.

Lockport, N. Y., 100 tons, Federal Mill & Elevator Co., to R. S. McMannus Steel Construction Co., Buffalo.

Buffalo, 700 tons, police headquarters, to R. S. McMannus Steel Construction Co.

Berwick, Pa., 150 tons, A. J. Sordoni hosiery mill building, to Bethlehem Fabricators, Inc.

Pittsburgh, 365 tons, flooring, Smithfield Street Bridge, to Fort Pitt Bridge Works Co.

Pottsville, Pa., 300 tons, stockhouse for brewery, to McClintic-Marshall Corpn.

Lebanon County, Pa., 150 tons, plate girder span for County commissioners, to McClintic-Marshall Corpn.

THE SOUTH

Charlotte, N. C., 415 tons, Textile Mart, to Southern Engineering Co.

Tallahatchie County, Miss., 200 tons, bridge, to Virginia Bridge & Iron Co.

CENTRAL STATES

Flint, Mich., 164 tons, State highway bridge over Flint River, to Mahon Structural Steel Co.

Kenosha, Wis., 175 tons, grade separation for North Shore Line, to Hansell-Elcock Foundry Co., Chicago.

Milwaukee, 120 tons, warehouse, to C. Hennecke Co., Milwaukee.

Ipswich, S. D., 100 tons, grade separation, to Milwaukee Bridge Co.

St. Louis, 100 tons, administration building for city's negro hospital, to Columbia Iron Works, St. Louis.

WESTERN STATES

Los Angeles, 28,000 tons, towers for Bureau of Water and Power; 23,000 tons to Tower Builders, Inc., and 5000 tons to McClintic-Marshall Corpn.

San Francisco, 160 tons, Peterson Tallow factory, to Herrick Iron Works.

State of Oregon, 122 tons, bridge in Linn and Polk counties, to Poole & McGonigle.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Saybrooke, Conn., 200 tons, repairs to Connecticut River Bridge for New York, New Haven & Hartford Railroad.

State of New York, 540 tons, highway bridges at Pavillon and Belvedere.

Buffalo, 240 tons, German-American Brewery Co., new brewery.

Elmira, N. Y., 300 tons, Erie Railroad grade crossing; Metzger Construction Co., Buffalo, low bidder.

Spring Brook, N. Y., 122 tons, Pennsylvania Railroad bridge.

Philadelphia, 200 tons, alterations for Peerless Brewing Co.

Norristown, Pa., 150 tons, bridge for Montgomery County; bids not yet asked.

York, Pa., 150 tons, bridge for York County; bids not yet asked.

State of Maryland, 170 tons, highway bridge over Deer Creek near Belair.

State of New York, 1100 tons, miscellaneous highway bridges; bids Aug. 11.

THE SOUTH

State of Virginia, 400 tons, highway bridge over Roanoke River at Mecklenburg.

CENTRAL STATES

Ferrysburg, Mich., 150 tons, building.

Granite City, Ill., 150 tons, building.

Des Moines, Iowa, 1000 tons, post office.

States of Indiana and Kentucky, 400 tons, highway bridges.

Port Washington, Wis., 310 tons, transmission towers for Milwaukee Electric Railway & Power Co.

WESTERN STATES

Wenatchee, Wash., 430 tons, county bridge, bids Aug. 14.

San Francisco, 225 tons, trusses for United States Forest Service; bids under advisement.

FABRICATED PLATE

AWARDS

Boston, 600 tons, pipe, State water project, to Walsh Boiler Works.

Medford, Mass., 840 tons, 5000 ft. of 60-in. welded pipe, to Walsh's Holyoke Steam Boiler Works, Holyoke, Mass.

Buffalo, 180 tons, grain hoppers for Eastern States Milling Co., to Ernst Iron Works, Buffalo.

Pittsburgh, 1300 tons, five barges for American Barge Line, Inc., to American Bridge Co.

Chicago, 150 tons, steel scow for city of Chicago, to Graver Tank & Mfg. Corpn.

Peoria, Ill., 1250 tons, 208 tanks for Pabst Corpn., to an unnamed fabricator.

San Francisco, 300 tons, County jail, to Judson Mfg. Co.

NEW PROJECTS

Staten Island, N. Y., 100 tons, 24 buoys for lighthouse bureau; award expected this week.

Orange, N. J., 700 tons, aging vats for Trommer Brewery.

Higher Scrap Prices in New England

BOSTON, Aug. 1.—Despite the fact that the New England melt has been stepped up, little pig iron was sold through local furnace representatives the past week. Further, there is no open inquiry of importance in the market, or are many expected in August. Several Connecticut foundries, however, probably will buy tonnages of higher silicon irons this month as there is a need of it. July New England deliveries by furnaces ran ahead of June, this year, and July, 1932. The reaction of foundries in general to the establishment of minimum pig iron prices is favorable, their contention being the elimination of "bargain" irons from the market. Furnaces are holding firmly to new price schedules.

Scrap

Scrap prices in general are higher without much increase in offerings. Very little scrap is available around Boston, and those outside this area owning material are, in most cases, still holding for yet higher prices. Small sales of textile cast have been made at $10 to $10.50 a ton, delivered, an advance of $1 a ton. No. 1 heavy melting steel has moved up 25c. a ton, and blast furnace scrap, forge flashings and steel turnings 25c. to 50c. Chemical borings have jumped $1 a ton. Quotations on bundled skeleton take a wide range, depending on the point of delivery, with average prices easily $1 higher than a week ago. Breakable cast is moving at $5.50 to $6 a ton on cars shipping point, mostly $5.50 to $5.75, and No. 2 steel has done likewise.

Coke

Shipments by New England foundry coke makers in July were 50 per cent or more heavier than in the corresponding month last year. The increase, however, does not represent a corresponding expansion in the New England iron melt, but rather depleted stocks in foundry yards.

Detroit Scrap Market Is Strong

DETROIT, Aug. 1.—The local scrap market is strong and prices reflect a bullish attitude on the part of dealers. Sizable tonnages of scrap are moving by water from Detroit to Cleveland and Buffalo. The Ford Motor Co. not only is shipping some of its accumulated holdings to Buffalo and Cleveland steel mills but also has out a list of borings and turnings. In these transactions the Ford company is dealing direct with users. Borings and short turnings are up 25c. a ton and machinery cast, stove plate, sheet clips and busheling have advanced a like amount.

June Sheet Backlog of Orders Gains 92,844 Tons

SALES, production and shipments of sheet steel products all rose sharply during June for the third consecutive month, according to the report of the National Association of Flat Rolled Steel Manufacturers, Pittsburgh, which includes producers with a monthly capacity of 325,000 net tons. This is approximately 59 per cent of the country's total capacity of 550,000 net tons monthly. These makers report sales of 246,737 net tons in June, as compared with 144,192 tons in May; production of 166,272 tons as compared with 139,696, and shipments of 152,953 tons as compared with 119,159 tons. Unfilled tonnage as of July 1 amounted to 229,436 or 70.7 per cent of capacity, as against 136,592 tons or 42.1 per cent of capacity one month before. The June report with comparisons of the two preceding months in net tons follows:

	June	May	April
Sales	246,737	144,192	118,594
Production	166,272	139,696	111,942
Shipments	152,953	119,159	100,353
Unfilled orders	229,436	136,592	111,311
Unshipped orders	54,288	47,696	44,044
Unsold stocks	50,067	51,295	47,815
Capacity per month	550,000	550,000	550,000
Percentage reporting	59.0	59.0	59.0

Percentages, Based on Capacity

Sales	76.0	44.4	36.5
Production	51.2	43.1	34.5
Shipments	47.1	36.7	30.9
Unfilled orders	70.7	42.1	34.3
Unshipped orders	16.7	14.7	13.6
Unsold stocks	15.4	15.8	14.7

Railroad Equipment

Wabash will spend $390,000 for conversion and repair of box cars at its Decatur, Ill., shops.

United Fruit Co. has purchased 20 additional 15-ton fruit cars from Pullman Car & Mfg. Corpn., for service in Columbia. A purchase of 50 similar cars was made for use in Panama.

Boston & Maine Railroad will rebuild 500 50-ton gondola coal cars, work to commence in September.

Pipe Lines

Stanolind Pipe Line Co., Houston, Tex., plans new 12-in. welded steel pipe line from Sinco oil terminal, Houston ship channel to new refinery of Pan-American Petroleum & Transport Co., an affiliated organization, at Texas City, Tex., about 31 miles, for crude oil. Another 10-in. line will be installed from Tomball oil field, Tex., to tank farm and refinery of Humble Oil & Refining Co., Baytown, Houston ship channel, about 45 miles.

Pasadena, Cal., asks bids until Aug. 15 for furnishing and installing about 18½ miles of 36-in. welded steel pipe, with connections, etc., for new water supply line from Pine Canyon Dam, San Gabriel Canyon, to Sunset Reservoir in city. Samuel B. Morris is chief engineer.

W. J. Sovereign, Bay City, Mich., operating oil and gas properties, has secured permission for steel pipe line along highway from Clare to Saginaw, Mich., for natural gas.

Gas Fuel Service Co., Hanford, Cal., has work under way on new natural gas steel pipe line. Entire program will cost over $500,000.

Guymon, Okla., is disposing of bond issue for municipal natural gas system, about 13 miles of steel pipe, and distributing plant. F. E. Devlin, Wheeler-Kelly-Hagny Building, Wichita, Kan., is consulting engineer.

Reinforcing Steel

Awards 2050 Tons—New Projects 4625 Tons

Hartford, Conn., 160 tons, Metropolitan water works dam, to Concrete Steel Co.

Brooklyn, 150 tons, Ehler's warehouse, to Igoe Bpthers.

Raleigh, N. C., 100 tons, University of North Carolina stadium, to Southern General Fireproof Co., Atlanta.

Chicago, 300 tons, store at Dearborn and Washington Streets.

State of Illinois, 400 tons, highway bridges.

Peoria, Ill., 200 tons, Premier Pabst Corpn., to Joseph T. Ryerson & Sons.

St. Louis, 325 tons, administration building for city's negro hospital, to Laclede Steel Co.

State of Idaho, 150 tons, highway bridge in Valley County, to Colorado Fuel & Iron Products Co.

San Francisco, 125 tons, for County jail, to Judson Mfg. Co.

Fairbanks, Alaska, 131 tons, school, to Soule Steel Co.

NEW REINFORCING BAR PROJECTS

State of Maine, 300 tons, road work.

State of New York, 2000 tons, mesh and bars for bridges and highways, bids Aug. 11.

Bayonne, N. J., 200 tons, Best Foods Products, Inc., factory.

Jersey City, N. J., 103 tons, St. Peter's College building.

Buffalo, 400 tons, warehouse for Danahy-Faxon Co.

Morris and Justice Park, Ill., 400 tons, bridge foundations.

State of Washington, 100 tons, highway bridge in Washington County; bids Aug. 3.

Los Angeles, 1108 tons for Bureau of Water and Power, Specification No. 3173, bids under advisement.

Cast Iron Pipe

Warren Foundry & Pipe Corpn. has been awarded 1950 tons of 10 to 16-in. for State of Massachusetts.

Carizzo Springs, Tex., plans a pipe line for municipal water system. Cost about $50,000 with pumping station and auxiliary equipment. Financing is being arranged.

Tampa, Fla., considering about 30,000 ft. of new pipe for water mains, 8 and 12-in., and smaller sizes. John S. Long is superintendent of water department.

Sulligent, Ala., asks bids until Aug. 8 for 27,000 ft. of 2 and 8-in. for water system. W. F. Jackson Co., Martin Building, Birmingham, is engineer.

Oklahoma City, Okla., plans main 72-in. trunk line from Mustang Lake, about 5½ miles, and smaller pipe, for extensions and improvements in water system. Entire project to cost over $5,000,000. Financing is being arranged. Thomas Banks is superintendent of water department.

Fond du Lac, Wis., is in the market for 7000 ft. of 6 to 12-in.

Signal Hill, Cal., will take bids Aug. 14 on 386 tons of 6 to 16-in.

▲▲ TRADE NOTES ▲▲

Selas Co., Eighteenth Street and Indiana Avenue, Philadelphia, manufacturer of industrial gas heating equipment, has expanded its business to include the design and construction of special automatic machinery for industrial heating processes. Penrose R. Hoopes, consulting engineer, with offices for the past 12 years at Hartford, Conn., has been retained as technical consultant on this work and will cooperate with the Selas engineering staff with offices at the company's headquarters in Philadelphia.

Cooley Electric Furnace Co. has been organized to manufacture "Bluehead" electric furnaces, for use in the laboratory and tool room. W. B. Cooley, who has been closely associated with the electric furnace business for many years, is in charge. A license for the use in electric furnaces of the "Doreco" heating element has been granted Mr. Cooley by the Doherty Research Corpn. General offices and factory are located at 47-32 Van Dam Street, Long Island City, N. Y.

Tuthill Spring Co., 760 Polk Street, Chicago, has appointed S. C. Ewing & Co., Nashville Trust Building, Nashville, Tenn., representatives in Kentucky and Tennessee for its highway guard, and Oscar Winter, Southwest Bolt & Nut Co., 1228 Hadley Avenue, St. Louis, representative for the same product in Missouri.

Compressed Industrial Gases, Inc., Chicago, and its subsidiaries, Burdett Oxygen and Hydrogen companies, have moved their general offices to LaSalle-Wacker Building, 221 North LaSalle Street. A. J. Russell, formerly vice-president and general manager, Bettendorf Oxygen-Hydrogen Co., Bettendorf, Iowa, has become manager of Burdett Oxygen Co. activities in Oklahoma, with headquarters at Oklahoma City.

Wrought Washer Mfg. Co., 2104 South Bay Street, Milwaukee, has appointed M. Swain, 52 Maypole Road, Quincy, Mass., distributer in New England for its line of standard and special washers, corner braces, corner irons and stampings.

Centre Machinery Co., 249 Centre Street, New York, is a partnership of M. Blumenthal and Sam Berkowitz, both formerly with A. Lamberg & Co., to buy and sell used machinery and engage in plant liquidation.

Covert Gear & Mfg. Co., Lockport, N. Y., receivers for this company have been ordered to arrange for sale of plant and property of company, and liquidate business. Receivership has been effective since 1931.

Homestead Valve Mfg. Co., Inc., Coraopolis, Pa., has appointed Reeves-McCormick, Inc., 5317 North Second Street, Philadelphia, representative in the Philadelphia district for its Hypressure Jenny vapor spray cleaning machines.

Kron Co., Bridgeport, Conn., automatic dial scales, has appointed the following distributers of its equipment: Ebbert & Kirkman Co., Inc., 321 Brown-Marx Building, Birmingham; William N. Schwab, 783 Seventeenth Street, Los Angeles, and Coe-Mantes Scale Co., 420 Market Street, San Francisco.

S. R. Dresser Mfg. Co., has bought The Bryant Heater & Mfg. Co.

Non-Ferrous Metals Hold Steady Despite Light Sales

Copper Remains Firm at 9c. Level; Lead Slightly Active—Tin Lower on Sterling Changes; Zinc Is Steady at 5c.

NEW YORK, Aug. 1.—Although unsupported by sizable purchases electrolytic copper remains unchanged and very firm at 9c. a lb., delivered Connecticut points. Shipments are well maintained. Only moderate buying interest has reappeared, and current sales are in limited volume. Practically no resale metal was offered during the past week, and scrap copper could not be secured under a 9c. level. First-hand sellers report negligible consumer interest in futures, despite the strong likelihood of advanced quotations when the industry commences to function under the code, and conversion costs increase. Codification will result in no stabilized price, but it does promulgate that offerings must not be made at levels below manufacturing costs. Since even the more efficient smelters have difficulty in converting metal at 9c. it would indicate that a price revision may occur after code acceptance. Domestic producers will continue to operate at 20 per cent of rated capacity until larger inroads are made in stocks which are still excessive. Foreign offerings eased downward throughout the week, and a fair business was transacted today at 8.32½c. to 8.45c. a lb., c.i.f. usual European ports. Continental demand, heretofore very light, sharply increased as quotations dropped to successively lower levels.

Tin

Although gyrating with sterling exchange, domestic metal tended to ease downward during the week. Consumers generally remained inactive, but several large tin plate interests warily watched daily fluctuations, and picked up limited tonnages of Straits on the breaks. Spot metal had little activity at 45.75c., late last week, and was being generally ignored today at 44.25c. a lb. Buyers here had expected market weakness arising from pool releases, but lack of European selling pressure of pool stocks seems to argue wary liquidation by quota signatories. London values, while comparatively steady, eased off throughout the week, with postings today at £212 7s. 6d., for spot Standard, £213 for future Standard and £217 7s. 6d. for spot Straights. Singapore offerings were shifted to a current level of £220 13s. Deliveries of metal into American consumption totaled 6450 tons for July, although much of this tin is yet to be consumed. The world's visible supply was 38,135 tons as of Aug. 1, representing a withdrawal of 1829 tons during July. Deliveries of English refined constituted 40 per cent of total July imports, indicating more activity in the past than was generally suspected. Current offerings have a nominal differential of ⅝c. to ¾c.

Lead

The market has a healthy tone. Consumers are buying limited amounts for day-by-day requirements at a firm price of 4.50c. a lb., New York, and 4.35c., St. Louis. September books were formally opened today, although several hundred tons had already been quietly placed during the past week. Current releases are heavy, and producers expect August shipments to reduce stocks materially, thereby further improving the July 31 statistical position of the metal. The London market eased off slightly, but retains a steady tone, and is exerting a healthy sentimental influence on domestic quotations. Consumers are adequately covered for immediate requirements. Buying interest in future metal is negligible, since no significant variation in price levels is expected.

Zinc

Smelters are experiencing a natural eddy in consumer interest. Supported by a steady flow of moderate sales prompt Prime Western has firmed at 5.37c. a lb., New York, or 5c., East St. Louis. Producers are showing no hesitancy about making offerings at 5c. for delivery through October, and there has been some November and December metal quietly placed at the 5c. level. Most smelters, however, are not indulging in extended fourth quarter activity. Releases against contracts continue to be in satisfactory volume. With general firming of metal prices the Joplin market has relaxed although miners retain a strong grip on the ore situation, and no immediate change of the $35 quotation is expected. Joplin ore production narrowed to 5000 tons last week, and sales dropped 400 tons to 5760 tons during the same period. Shipments totaled 6800 tons, and visible stocks were estimated at 12,850 tons.

Copper Averages

The average price of Lake copper for July, based on daily quotations in THE IRON AGE, was 8.88c. a lb., delivered, New York. The average price of electrolytic copper for that month was 8.63c., refinery, or 8.88c., delivered Connecticut.

The Week's Prices. Cents Per Pound for Early Delivery

	July 26	July 27	July 28	July 29	July 31	Aug. 1
Electrolytic copper, N. Y.*	8.75	8.75	8.75	8.75	8.75	8.75
Lake copper, New York	9.00	9.00	9.00	9.00	9.00	9.00
Straits tin, Spot, N. Y.	45.75	45.25	45.12½	....	44.62½	44.25
Zinc, East St. Louis	5.00	5.00	5.00	5.00	5.00	5.00
Zinc, New York	5.37	5.37	5.37	5.37	5.37	5.37
Lead, St. Louis	4.35	4.35	4.35	4.35	4.35	4.35
Lead, New York	4.50	4.50	4.50	4.50	4.50	4.50

*Refinery quotations; price ¼c. higher delivered in Connecticut.

Aluminum, 98 to 99 per cent pure, 22.90c. a lb., delivered.
Nickel electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 7.25c. a lb., New York.
Brass ingots, 85-5-5-5, 9c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	46.00c. to 48.00c.
Tin, bar	48.00c. to 50.00c.
Copper, Lake	10.50c. to 11.25c.
Copper, electrolytic	10.25c. to 10.75c.
Copper, castings	10.00c. to 11.00c.
*Copper sheets, hot-rolled	15.62½c.
*High brass sheets	14.25c.
*Seamless brass tubes	15.87½c.
*Seamless copper tubes	16.12½c.
*Brass rods	11.75c.
Zinc, slabs	6.25c to 7.25c.
Zinc sheets (No. 9), casks	9.75c. to 10.00c.
Lead, American pig	5.50c. to 6.50c.
Lead, bar	7.00c. to 8.00c.
Lead, sheets	8.25c.
Antimony, Asiatic	8.50c. to 9.50c.
Alum., virgin, 99 per cent plus	23.30c.
Alum. No. 1 for remelting, 98 to 99 per cent.	18.00c. to 19.00c.
Solder, ½ and ½	30.00c. to 31.00c.
Babbitt metal commercial grade	25.00c. to 50.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	49.50c.
Tin, bar	51.50c.
Copper, Lake	10.25c.
Copper, electrolytic	10.25c.
Copper, casting	10.00c.
Zinc, slab	5.75c. to 6.00c.
Lead, American pig	5.35½c. to 5.50c.
Lead, bar	8.50c.
Antimony, Asiatic	8.50c.
Babbitt metal, medium grade	19.00c.
Babbitt metal, high grade	53.50c.
Solder, ½ and ½	27.50c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	7.25c.	8.00c.
Copper, hvy. and wire	7.25c.	8.00c.
Copper, light and bottoms	6.00c.	6.75c.
Brass, heavy	4.00c.	4.75c.
Brass, light	3.50c.	4.00c.
Hvy. machine composition	5.75c.	6.25c.
No. 1 yel. brass turnings	5.00c.	5.625c.
No. 1 red brass or compos. turnings	5.25c.	5.875c.
Lead, heavy	3.625c.	4.00c.
Zinc	2.75c.	3.25c.
Cast aluminum	7.50c.	8.75c.
Sheet aluminum	12.00c.	13.50c.

Prices of Finished and Semi-Finished Steel, Coke, Coal, Cast Iron Pipe

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel

Base per Lb.

F.o.b. Pittsburgh mill .....1.60c.
F.o.b. Chicago .....1.70c.
Del'd Philadelphia .....1.91c.
Del'd New York .....1.95c.
Del'd Detroit .....1.80c.
F.o.b. Cleveland .....1.65c.
F.o.b. Lackawanna .....1.70c.
F.o.b. Birmingham .....1.75c.
C.i.f. Pacific ports .....2.10c.

Billet Steel Reinforcing

(Cut lengths as quoted by distributers)

F.o.b. P'gh mills ..... 1.75c.
F.o.b. Birmingham ..... 1.75c.
F.o.b. Cleveland .....1.75c. to 1.80c.

Rail Steel

F.o.b. mills, east of Chicago dist. ..1.50c.
F.o.b. Chicago Heights mills .....1.50c.

Iron

Common iron, f.o.b. Chicago .....1.60c.
Refined iron, f.o.b. P'gh mills .....2.75c.
Common iron, del'd Philadelphia ..1.86c.
Common iron, del'd New York .....1.90c.

Tank Plates

Base per Lb.

F.o.b. Pittsburgh mill.....1.60c.
F.o.b. Chicago .....1.70c.
F.o.b. Birmingham .....1.75c.
Del'd Cleveland .....1.8035c.
Del'd Philadelphia .....1.7935c.
F.o.b. Coatesville .....1.70c.
F.o.b. Sparrows Point .....1.70c.
Del'd New York .....1.898c.
C.i.f. Pacific ports .....2.10c.
Wrought iron plates, f.o.b. P'gh ...3.00c.

Structural Shapes

Base per Lb.

F.o.b. Pittsburgh mill .....1.60c.
F.o.b. Chicago .....1.70c.
F.o.b. Birmingham .....1.75c.
F.o.b. Lackawanna .....1.70c.
F.o.b. Bethlehem .....1.70c.
Del'd Cleveland .....1.8035c.
Del'd Philadelphia .....1.80175c.
Del'd New York .....1.86775c.
C.i.f. Pacific ports (standard) .....2.10c.
C.i.f. Pacific ports (wide flange) ..2.20c.

Steel Sheet Piling

Base per Lb.

F.o.b. Pittsburgh .....1.90c.
F.o.b. Chicago mill .....2.05c.
F.o.b. Buffalo .....2.00c.

Alloy Steel Bars

(F.o.b. Pittsburgh, Chicago, Buffalo, Massillon or Canton.)

Alloy Quantity Bar Base,
2.45c. to 2.65c. per Lb.

S.A.E. Series Numbers	Alloy Differential per 100 Lb.
2000 (½% Nickel)	$0.25
2100 (2½% Nickel)	0.55
2300 (3½% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.16 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum). (1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	0.20
6100 Chromium Vanadium Bar	1.20
4100 Chromium Vanadium Spring Steel	0.95
9250 Silicon Manganese Spring Steel (flats)	0.25
Rounds and Square	0.50
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars forging quality. The differential for cold-drawn bars is ⅜c. a lb. higher, with standard classification for cold-finish alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a section area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Cold Finished Bars*

Bars, f.o.b. Pittsburgh Mill.....1.95c.
Bars, f.o.b. Chicago .....2c.
Bars, Cleveland .....2c.
Bars, Buffalo .....2c.
Bars, Detroit .....2.15c.
Bars, eastern Michigan .....2.20c.
Shafting, ground, f.o.b. mill,
1⅛ in. 3.00c.
1-3/16 to 1¼ in. 2.50c.
1-9/16 to 1⅞ in. 2.35c.
1-15/16 to 2⅞ in. 2.20c.
2-15/16 to 6 in. 2.05c.

* In quantities of 10,000 to 19,999 lb.

SHEETS, STRIP, TIN PLATE TERNE PLATE

Sheets

Hot-Rolled

No. 10, f.o.b. Pittsburgh ..... 1.65c.
No. 10, f.o.b. Chicago mill ..... 1.75c.
No. 10, del'd Philadelphia ..... 1.96c.
No. 10, f.o.b. Birmingham ..... 1.80c.
No. 10, c.i.f. Pacific Coast ports. 2.27½c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh 2.25c
No. 24, f.o.b. Chicago mills ..... 2.35c.
No. 24, del'd Philadelphia ..... 2.56c.
No. 24, f.o.b Birmingham ..... 2.40r.
No. 24, c.i.f. Pacific Coast ports.. 2.90c.
No. 24, wrought iron, Pittsburgh ..4.30c.

Heavy Cold-Rolled (Mill Run)

No. 10 gage, f.o.b. Pitts'h ..... 1.95c.
No. 10 gage, f.o.b. Chicago mills.. 2.05c.
No. 10 gage, del'd Phila. ..... 2.26c.
No. 10 gage, del'd Pacific Coast ports 2.70c.

Light Cold-Rolled (Mill Run)

No. 20 gage, f.o.b. Pitts'h ..... 2.40c.
No. 20 gage, f.o.b. Chicago mills.. 2.50c.
No. 20 gage, del'd Phila. ..... 2.56c.
No. 20 gage, del'd Pacific Coast ports 2.95c.

Auto Body and Steel Furniture

No. 10, f.o.b. Pittsburgh ..... 2.15c.
No. 20 f.o.b. Pittsburgh ..... 2.60c.
No. 20, f.o.b. Chicago ..... 2.70c.

Galvanized Sheets

No. 24, f.o.b. Pittsburgh ..... 2.85c.
No. 24, f.o.b. Chicago mills ..... 2.95c.
No. 24, del'd Philadelphia ..... 3.16c.
No. 24, f.o.b. Birmingham ..... 3.00c.
No. 24, c.i.f. Pacific Coast ports.. 3.50c.
No. 24, wrought iron, Pittsburgh ...4.95c

Long Terne

No. 24, unassorted, 8-lb. coating f.o.b. Pittsburgh ..... 2.90c.

Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh .....2.90c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh .....2.50c.
No. 28, Chicago mill .....2.60c.

Tin Plate

Base per Box

Standard cokes, f.o.b. P'gh district mill $4.25
Standard cokes, f.o.b. Gary 4.35

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)
(Per Package, 20 x 28 in.)

8 lb. coating I.C. $8.70
15-lb. coating I.C. 11.00
20-lb. coating I.C. 11.90
25-lb. coating I.C. 13.00
30-lb. coating I.C. 13.80
40-lb. coating I.C. 15.30

Hot-Rolled Hoops, Bands, Strips and Flats under ¼ In.

Base per Lb.

All widths up to 24 in., Pittsburgh .....1.60c. to 1.65c.
All widths up to 24 in., Chicago .....1.70c. to 1.75c.
Cooperage stock, P'gh .....1.70c. to 1.75c.
Cooperage stock, Chicago..1.80c. to 1.85c.

Cold-Rolled Strips

F.o.b. Pittsburgh ..... 2.25c.
F.o.b. Cleveland 2.25c
Del'd Chicago ..... 2.55c.
F.o.b. Worcester ..... 2.45c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland ..... 2.85c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade

Per Lb.

Bright wire .....2.10c.
Spring wire .....3.10c.

To Jobbing Trade

Extras of 10c. a 100 lb. on mixed carloads, 20c. on joint carloads and 30c. on pooled cars and less-than-carload lots are applied on all merchant wire products. In carloads and mixed carloads a discount of 10 per cent on extras is allowed.

Base per Keg

Standard wire nails $2.10
Smooth coated nails 2.10
Galvanized nails 3.60

Base per 100 Lb.

Smooth annealed wire $2.25
Smooth galvanized wire..... 2.60
Polished staples 2.80
Galvanized staples 3.05
Barbed wire, galvanized 2.60
Woven wire fence, base column....$55.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is $2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are $2 a ton over Pittsburgh (except for woven wire fence at Duluth which is $3 over Pittsburgh), and Birmingham mill prices are $3 a ton over Pittsburgh.

STEEL AND WROUGHT PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio Mills

Butt Weld

Steel Inches	Steel Black	Steel Galv.	Wrought Iron Inches	Wrought Iron Black	Wrought Iron Galv.
⅛	51½	29½	⅛	+9	+13
¼ to ⅜	57	38½	¼ & ⅜	+13	+21½
½	62	50½	½	31½	15
¾	65½	55½	¾	36½	20½
1 to 3	67½	58½	1&1¼	39½	25½
			1½	43½	28
			2	41½	26

Lap Weld

2	63½	54½	2	37	22½
2½ to 3	66½	57½	2½ to 3½	38	25
3½ to 6	68½	59½	4 to 8	40	28½
7 and 8	57½	57	9 to 12	38	24½
9 and 10	67	57			
11 and 12	66	56			

Butt Weld, extra strong, plain ends

⅛	48½	33½	⅛	+13	+45½
¼ to ⅜	54½	41½	¼ & ⅜	+2½	+34½
½	60	51	½	32½	17½
¾	64½	55½	¾	37½	22½
1 to 3	66½	58½	1 to 2	43½	29

Lap Weld, extra strong, plain ends

2	61½	53½	2	40	26
2½ to 3	65½	57½	2½ to 4	45½	33
3½ to 6	69	61	4½ to 6	45	32½
7 to 8	68	58	7 & 8	46	33
9 and 10	67	57	9 to 12	41½	30
11 and 12	66	56			

Discounts on steel and wrought iron pipe are net and not subject to any points or preferentials.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	33	1½ in.	1
2½ in.—2¾ in.	40	1¾ in.	8
3 in.	47	2 in.—2¼ in.	13
3¼ in.—4¼ in.	50	2½ in.—2¾ in.	16
4 in.	52	3 in.	17
4½ in. to 6 in	42	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold-Drawn

1 in.	61	3 in.	41
1¼ to 1½ in.	53	3¼ to 3½ in.	44
1¾ in.	37	4 in.	46
2 to 2¼ in.	27	4½, 5 and 6 in.	36
2½ to 2¾ in.	34		

Hot Rolled

2 and 2¼ in.	33	3¼ to 3½ in.	50
2½ and 2¾ in.	40	4 in.	52
3 in.	47	4½, 5 and 6 in.	42

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb. base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. in lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

Per Cent Off List

Carbon, 0.10% to 0.30% base (carloads) 55
Carbon, 0.30% to 40% base 50

Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

RAILS AND TRACK SUPPLIES

Rails

Per Gross Ton

Standard, f.o.b. mill $40.00
Light (from billets), f.o.b. mill ... 30.00
Light (from rail steel), f.o.b. mill.. 26.00

Track Equipment

Base per 100 Lb.

Spikes, 9/16 in. and larger.....$2.40
Spikes, ½-in. and smaller..... 2.40
Spikes, boat and barge 2.60
Tie plates, steel 1.90
Angle bars 2.55
Track bolts, to steam railroads 3.50
Track bolts, to jobbers, all sizes, (per 100 count) .....73 per cent off list

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Per Cent Off List

Machine bolts 73
Carriage bolts 73
Lag bolts 73
Plow bolts, Nos. 1, 2, 3 and 7 heads.. 73
Hot-pressed nuts, blank or tapped, square 73
Hot-pressed nuts, blank or tapped, hexagons 73
C.p.c. and t. square or hex nuts, blank or tapped 73
Semi-finished hexagon nuts 73
Semi-finished hexagon castellated nuts, S.A.E. 73
Stove bolts in packages, P'gh, 72½, 25 and 10
Stove bolts in packages, Ch'go, 72½, 25 and 10
Stove bolts in packages, Cleveland, 72½, 25 and 10
Stove bolts in bulk, P'gh 85
Stove bolts in bulk, Chicago 85
Stove bolts in bulk, Cleveland 85
Tire bolts 60

Large Rivets

(½-in. and larger)

Base per 100 Lb.

F.o.b. Pittsburgh or Cleveland.....$2.50
F.o.b. Chicago 2.60

Small Rivets

(7/16-in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh .....70, 10 and 5
F.o.b. Cleveland .....70, 10 and 5
F.o.b. Chi'go and Birm'g'm....70, 10 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 65c. per 100 lb. on lots of 200 lb. or more)

Per Cent Off List

Milled cap screws, 1 in. dia. and smaller 85
Milled standard set screws, case hardened, 1 in. dia. and smaller..... 80
Milled headless set screws, cut thread ¾ in. and smaller .....75 and 10
Upset hex. head cap screws, U.S.S.S or S.A.E. thread, 1 in. dia. and smaller .....85 and 10
Upset set screws, sq. head..... 80
Milled studs 70

SEMI-FINISHED STEEL

Billets and Blooms

Per Gross Ton

Rerolling, 4-in. to 6-in. inclusive Pittsburgh $26.00
Rerolling, 4-in. to 6-in. inclusive Youngstown 26.00
Rerolling, 4-in. to 6-in. inclusive Cleveland 26.00
Rerolling, 4-in. to 6-in. inclusive Chicago 26.50
Forging quality, Pittsburgh..... 31.00
Forging quality, Youngstown 31.00

Sheet Bars

(Open-Hearth or Bessemer)

Per Gross Ton

Pittsburgh $26.00
Youngstown 26.00
Cleveland 26.00

Slabs

(3 in. x 2 in. and under 10 in. x 10 in.)

Per Gross Ton

Pittsburgh $26.00
Youngstown 26.00
Cleveland 26.00

Pig Iron, Ores, Ferroalloys

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.60c.
Universal	1.60c.
Sheared	1.60c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$35.00
Cleveland	35.00
Chicago	36.00

COKE, COAL AND FUEL OIL

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville Prompt	$2.50 to $3.50
Foundry, f.o.b. Connellsville Prompt	3.00 to 4.00
Foundry, by-product, Chicago ovens, for delivery outside switching districts	7.50
Foundry, by-product, delivered in Chicago switching district	8.25
Foundry, by-product, New England, delivered	10.00
Foundry, by-product, Newark or Jersey City, del'd	8.20 to 8.81
Foundry, by-product, Phila.	8.50
Foundry, by-product, Cleveland, delivered	8.26
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b ovens	8.00
Foundry, by-product, del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.10 to $1.20
Mine run coking coal f.o.b. W. Pa.	1.40 to 1.50
Gas coal, ¾-in., f.o.b. Pa. mines	1.30 to 1.40
Mine run gas coal, f.o.b. Pa. mines	1.30 to 1.40
Steam slack, f.o.b. W. Pa. mines	0.45 to 0.55
Gas slack, f.o.b. W. Pa. mines	0.65 to 0.75

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.

No. 3 distillate	4.00c.
No. 4 industrial	3.50c.

Per Gal. f.o.b. Baltimore

No. 3 distillate	4.00c.
No. 4 industrial	3.50c.

Per Gal. del'd Chicago

No. 3 industrial fuel oil	3.73c.
No. 5 industrial fuel oil	3.23c.

Per Gal. f.o.b. Cleveland

No. 3 distillate	5.25c.
No. 4 industrial	5.00c.

REFRACTORIES

Fire Clay Brick

	Per 1000 f.o.b. Works High-heat Duty Brick	Intermediate Duty Brick
Pennsylvania	$40.00	$35.00
Maryland	40.00	35.00
New Jersey	50.00	38.00
Ohio	40.00	35.00
Kentucky	40.00	35.00
Missouri	40.00	35.00
Illinois	40.00	35.00
Ground fire clay, per ton	7.00	

Chrome Brick

	Per Net Ton
Standard size	$45.00

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$40.00
Chicago	49.00
Birmingham	50.00
Silica clay, per ton	8.00

Magnesite Brick

	Per Net Ton
Standard sizes, burned, f.o.b. Baltimore and Chester, Pa.	$65.00
Unburned, f.o.b. Baltimore	52.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Domestic, f.o.b. Chewelah, Wash.	22.00

CAST IRON PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$43.40 to $44.40
4-in., del'd Chicago	46.40 to 47.40
6-in., and larger, del'd New York	38.30
4-in., del'd New York	41.30
6-in., and larger, Birmingham,	$35.00 to 36.00
4-in., Birmingham	38.00 to 39.00

Class "A" and gas pipe, $3 extra.

VALLEY

Per Gross ton f.o.b. Valley furnace:

Basic	$16.00
Bessemer	17.00
Gray forge	16.50
No. 2 foundry	16.50
No. 3 foundry	16.00
Malleable	16.50
Low phos., copper free	25.00

Freight rate to Pittsburgh or Cleveland district, $1.89.

PITTSBURGH

Per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$16.50
No. 2 foundry	17.00
No. 3 foundry	16.50
Malleable	17.00
Bessemer	17.50

Freight rates to points in Pittsburgh district range from 69c. to $1.26.

CHICAGO

Per gross ton at Chicago furnaces:

N'th'n No. 2 fdy.	$17.00
N'th'n No. 1 fdy.	17.50
Malleable, not over 2.25 sil.	17.00
High phosphorus	17.00
Lake Super. charcoal, sil. 1.50, by rail	23.17
Southern No. 2 fdy.	$16.14 to 17.14
Low. phos., sil. 1 to 2, copper free.	25.00
Silvery, sil. 8 per cent.	28.17
Bess. ferrosil'n, 15 per cent.	38.67

Prices are delivered consumers' yards except on Northern foundry, high phosphorous and malleable, which are f.o.b. local furnaces, not including a switching charge.

ST. LOUIS

Per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$17.00
Del'd St. Louis	17.85
Malleable, f.o.b. Granite City	17.50
Southern fdy., sil. 1.75 to 2.25 del'd St. Louis	17.35

Freight rates, 83c (average) Granite City to St. Louis; $2.30 from Chicago; $4.56 from Birmingham.

NEW YORK

Per Gross ton, delivered New York district:

*Buffalo, No. 2, del'v'd eastern N. J.	$18.41 to $18.91
*Buffalo malleable, del'v'd eastern N. J.	18.91 to 19.41
East Pa. No. 2 fdy. del'v'd eastern N. J.	18.02 to 18.52

Freight rates: $1.52 to $2.63 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of $3.41 a ton from Buffalo.

BUFFALO

Per gross ton, f.o.b. furnace:

*No 2 fdy.	$17.00
Malleable, sil. up to 2.25	17.50
Basic	15.00
Lake Superior charcoal, del'd	23.41

*Each increase of 25 points of silicon above base foundry grade takes 25c. extra.

CINCINNATI

Per gross ton, delivered Cincinnati:

Ala. fdy., sil. 1.75 to 2.25	$17.75
Tenn. fdy., sil. 1.75 to 2.25	17.75
N'th'n No. 2 foundry	$18.13 to 19.52
S'th'n Ohio silvery, 8%	25.14

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.82 from Birmingham.

CLEVELAND

Per gross ton at Cleveland furnace:

N'th'n No. 2 fdy.	$16.50
Malleable	16.50
Ohio silvery, 8 per cent	26.25
Stand. low. phos., Valley	25.00
Southern No. 2 fdy.	17.14

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates; 63c. average local switching charge; $3.00 from Jackson, Ohio; $6.14 from Birmingham.

PHILADELPHIA

Per gross ton at Philadelphia:

*East. Pa. No. 2	$17.34
Basic (del'd east Pa.)	17.09
Malleable	17.84
Stand. low phos. (f.o.b. east. Pa. furnace)	$22.00 to $23.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 23.00
Va. No. 2	21.79
Va. No. 2X	22.29

Prices, except as specified otherwise, are delv'd Philadelphia. Freight rates: 84c. to $1.79 from eastern Pennsylvania furnaces; $4.67 from Virginia furnaces.

*Each increase of 25 points of silicon above base grade takes 25c. extra.

BIRMINGHAM

Per gross ton, f.o.b. Birmingham dist. furnace:

No. 2 fdy., 1.75 to 2.25 sil.	$13.00
Basic	13.00

NEW ENGLAND

Per gross ton delivered Boston and nearby New England points:

Mystic, sil. 1.75 to 2.25	$18.50
Buffalo, sil. 1.75 to 2.25	18.50
Ala., sil. 1.75 to 2.25	18.00

CANADA

Per gross ton:

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75	$21.00
No. 2 fdy., sil. 1.75 to 2.75	20.50
Malleable	21.00

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75	$22.50
No. 2 fdy., sil. 1.75 to 2.25	22.00
Malleable	22.50
Basic	22.00

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard, (carloads)	$82.00
Domestic, 80%, seaboard, (less carloads)	89.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$27.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50% (carloads)	$74.50
50% (less carloads)	82.00
75% (carloads)	120.00
75% (less carloads)	130.00
14% to 16% (f.o.b.) Welland, Ont. (in carloads)	31.00
14% to 16% (less carloads)	36.00

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
6%	$21.25	12%	$28.25
7%	22.25	13%	29.75
8%	23.25	14%	31.25
9%	24.25	15%	32.75
10%	27.25	16%	34.25
11%	26.75	17%	35.75

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
10%	$26.25	14%	$32.25
11%	27.75	15%	33.75
12%	29.25	16%	35.25
13%	30.75	17%	36.75

Manganese 1½ to 3%. $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.65% or over, $1 a ton additional.

Other Ferroalloys

Ferrotungsten, per lb. wo. del., carloads	94c.
Ferrotungsten, less carloads	$1.00
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	9.50c.
Ferrochromiuh, 2% carbon	16.50c. to 17.00c.
Ferrochromium, 1% carbon	17.50c. to 18.00c.
Ferrochromium, 0.10% carbon	19.50c. to 20.00c.
Ferrochromium, 0.06% carbon	20.00c. to 20.50c.
Ferrovanadium, del., per lb. contained Va.	$2.60 to 2.80
Ferrocarbontitanium, 15 to 18% per net ton, f.o.b. furnace in carloads	160.00
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton with $2 unitage	50.00
Ferrophosphorous, electric, 24% f.o.b. Anniston, Ala., per gross ton with $2.75 unitage	65.00
Ferromolybdenum, per lb. Mo., del.	95c.
Calcium molybdate, per lb. Mo., del.	80c.
Silico spiegel, per ton, f.o.b. furnace, car lots	$36.00
Ton lots or less, per ton	41.00
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	85.00
2% carbon grade	90.00
1% carbon grade	100.00
Spot prices	$5 a ton higher

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range, Bessemer, 51.5% iron	$4.80
Old range, non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorous, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algerian	8c.
Iron, low phos., Swedish, average 65½% iron	8.50c.
Iron, basic or foundry, Swedish, average, 65% iron	8c.
Iron, basic or foundry, Russian, aver. 65% iron (nom.)	8c.
Manganese, Caucasian, washed 52%	22c.
Manganese, African, Indian, 44-48%	20c.
Manganese, African, Indian, 49-51%	21c.
Manganese, Brazilian, 46 to 48½	17c.

	Per Net Ton Unit
Tungsten, Chinese wolframite, duty paid*	$12.00
Tungsten, domestic scheelite*	$11.00 to $12.00

	Per Gross Ton
Chrome, 45%, Cr_2O_3, crude, c.i.f. Atlantic Seaboard	16.00
Chrome, 48%, Cr_2O_3, c.i.f. Atlantic seaboard	18.00

*Quotations nominal in absence of sales.

Fluorspar

	Per Net Ton
Domestic, washed gravel, 85-5 f.o.b. Kentucky and Illinois mines	$14.00
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines	16.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	17.90
Domestic, No. 1 ground bulk, 85 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	30.00

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$13.50 to $14.00
No. 2 heavy melting steel	11.50 to 12.00
No. 2 railroad wrought	13.50 to 14.00
Scrap rails	13.50 to 14.00
Rails 3 ft. and under	15.00 to 15.50
Sheet bar crops, ordinary	14.50 to 15.00
Compressed sheet steel	13.00 to 13.50
Hand bundled sheet steel	12.00 to 12.50
Hvy. steel axle turnings	11.50 to 12.00
Machine shop turnings	10.50 to 11.00
Short shov. steel turnings	10.50 to 11.00
Short mixed borings and turnings	10.00 to 10.50
Cast iron borings	10.00 to 10.50
Cast iron carwheels	13.00 to 13.50
Heavy breakable cast	10.00 to 10.50
No. 1 cast	11.50 to 12.00
Railr. knuckles and couplers	15.00 to 15.50
Rail, coil and leaf springs	15.00 to 15.50
Rolled steel wheels	15.00 to 15.50
Low phos. billet crops	16.00 to 16.50
Low phos. sheet bar crops	15.00 to 15.50
Low phos. plate scrap	15.00 to 15.50
Low phos. punchings	15.00 to 15.50
Steel car axles	16.00 to 16.50

CHICAGO

Delivered Chicago district consumers:

	Per Gross Ton
Heavy melting steel	$10.50 to $11.00
Shoveling steel	10.50 to 11.00
Hydraulic comp. sheets	$9.00 to $9.50
Drop forge flashings	8.50 to 9.00
No. 1 busheling	9.25 to 9.75
Rolled carwheels	11.75 to 12.25
Railroad tires	11.50 to 12.50
Railroad leaf springs	11.50 to 12.00
Axle turnings	8.50 to 9.00
Steel couplers and knuckles	11.00 to 11.50
Coil springs	11.75 to 12.25
Axle turnings (elec. fur.)	8.50 to 9.00
Low phos. punchings	12.00 to 12.50
Low phos. plates, 12 in. and under	12.00 to 12.50
Cast iron borings	6.50 to 7.00
Short shoveling turnings	6.50 to 7.00
Machine shop turnings	6.00 to 6.50
Rerolling rails	12.00 to 12.50
Steel rails, less than 3 ft.	11.75 to 12.25
Steel rails, less than 2 ft.	12.00 to 12.50
Angle bars steel	11.50 to 12.00
Cast iron carwheels	10.50 to 11.00
Railroad malleable	10.50 to 11.00
Agricultural malleable	8.50 to 9.00

Per Net Ton

Iron car axles	$12.50 to $13.00
Steel car axles	11.50 to 12.00
No. 1 railroad wrought	9.00 to 9.50
No. 2 railroad wrought	9.00 to 9.50

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No. 2 busheling	$4.00 to	$4.50
Locomotive tires, smooth	9.00 to	9.50
Pipe and flues	4.75 to	5.25
No. 1 machinery cast	10.50 to	11.00
Clean automobile cast	10.00 to	10.50
No. 1 railroad cast	10.00 to	10.50
No. 1 agricultural cast	8.75 to	9.25
Stove plate	7.75 to	8.25
Grate bars	6.75 to	7.25
Brake shoes	9.75 to	10.25

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$11.50 to	$12.00
No. 2 heavy melting steel	10.00 to	10.50
No. 1 railroad wrought		12.00
Bundled sheets	8.50 to	9.00
Hydraulic compressed, new	10.50 to	11.00
Hydraulic compressed, old	8.50 to	9.00
Machine shop turnings		8.00
Heavy axle turnings	10.00 to	10.50
Cast borings		9.00
Heavy breakable cast	10.00 to	10.50
Stove plate (steel works)		9.00
No. 1 low phos. heavy		15.00
Couplers and knuckles		14.00
Rolled steel wheels		14.00
No. 1 blast furnace		7.00
Spec. iron and steel pipe	10.00 to	10.50
Shafting	15.00 to	15.50
Steel Axles	15.00 to	16.00
No. 1 forge fire		10.50
Cast iron carwheels	12.50 to	13.00
No. 1 cast	12.00 to	13.00
Cast borings (chem.)	10.00 to	10.50
Steel rails for rolling	12.00 to	12.50

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$11.00 to	$11.25
No. 2 heavy melting steel	10.50 to	10.75
Compressed sheet steel	10.00 to	10.50
Light bundled sheet stampings	6.50 to	7.00
Drop forge flashings	10.00 to	10.50
Machine shop turnings	7.50 to	8.00
Short shoveling turnings	8.00 to	8.50
No. 1 busheling	10.00 to	10.50
Steel axle turnings	7.50 to	8.00
Low phos. billet crops	12.50 to	13.00
Cast iron borings	8.00 to	8.50
Mixed borings and short turnings	8.00 to	8.50
No. 2 busheling	8.00 to	8.25
No. 1 cast	11.00 to	11.50
Railroad grate bars	6.50 to	7.00
Stove plate	7.50 to	8.00
Rails under 3 ft.	10.00 to	10.50
Rails for rolling	10.50 to	11.00
Railroad malleable	10.00 to	10.50
Cast iron carwheels		11.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	$10.50 to	$11.00
No. 2 heavy melting scrap	10.00 to	10.50
Scrap rails	8.75 to	9.25
New hydraul. comp. sheets	9.75 to	10.25
Old hydraul. comp. sheets	9.25 to	9.75
Drop forge flashings	9.25 to	9.75
No. 1 busheling	8.75 to	9.25
Hvy. steel axle turnings	7.50 to	8.00
Machine shop turnings	6.25 to	6.50
Knuckles and couplers	11.50 to	12.00
Coil and leaf springs	11.50 to	12.00
Rolled steel wheels	11.50 to	12.00
Low phos. billet crops	12.50 to	13.00
Short shov. steel turnings	6.50 to	7.00
Short mixed borings and turnings	6.50 to	7.00
Cast iron borings	6.50 to	7.00
No. 2 busheling	6.00 to	6.50
Steel car axles	11.00 to	12.00
Iron axles	11.00 to	12.00
No. 1 machinery cast	11.25 to	12.25
No. 1 cupola cast	11.00 to	12.00
Stove plate	8.75 to	9.25
Steel rails, 3 ft. and under	12.00 to	12.50
Cast iron carwheels	9.00 to	9.50
Industrial malleable	11.50 to	12.00
Railroad malleable	12.00 to	12.50
Chemical borings	7.50 to	8.00

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	$10.00 to	$10.50
Scrap steel rails		10.00
Short shoveling turnings		5.50
Stove plate	7.00 to	7.50
Steel axles	11.00 to	11.50
Iron axles	11.00 to	11.50
No. 1 railroad wrought	7.00 to	7.50
Rails for rolling		11.50
No. 1 cast		10.50
Tramcar wheels		10.00
Cast iron borings, chem.		8.00

ST. LOUIS

Per gross ton delivered consumers' yards:

Selected heavy steel	$9.50 to	$10.00
No. 1 heavy melting	8.50 to	9.00
No. 2 heavy melting	8.00 to	8.50
No. 1 locomotive tires	7.00 to	7.50
Misc stand.-sec. rails	10.00 to	10.50
Railroad springs	9.50 to	10.00
Bundled sheets	6.00 to	6.50
No. 2 railroad wrought	8.50 to	9.00
No. 1 busheling	3.50 to	4.00
Cast iron borings and shoveling turnings	3.00 to	3.50
Rails for rolling	10.50 to	11.00
Machine shop turnings	3.00 to	3.50
Heavy turnings	4.00 to	4.50
Steel car axles	10.00 to	10.50
Iron car axles	11.00 to	11.50
Wrot. iron bars and trans.	8.50 to	9.00
No. 1 railroad wrought	6.00 to	6.50
Steel rails less than 3 ft.	11.50 to	12.00
Steel angle bars	10.00 to	10.50
Cast iron carwheels	8.50 to	9.00
No. 1 machinery cast	8.00 to	8.50
Railroad malleable	8.00 to	8.50
No. 1 railroad cast	8.00 to	8.50
Stove plate	7.00 to	7.50
Relay rails, 60 lb. and under	16.00 to	16.50
Relay, rails, 60 lb. and over	$20.00 to	$21.00
Agricult. malleable	6.00 to	6.50

BOSTON

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$7.25 to	$7.75
Scrap T rails	7.00 to	7.50
Machine shop turnings	4.25 to	4.50
Cast iron borings	4.25 to	4.50
Bundled skeleton, long	5.50 to	6.25
Forge flashings	4.75 to	5.00
Blast furnace scrap	4.75 to	5.00
Shafting	9.00 to	9.50
Steel car axles	8.50 to	9.00
Wrought pipe	3.50 to	4.00
Rails for rerolling	6.00 to	6.50
Cast iron borings, chemical	10.00 to	10.50

Per gross ton delivered consumers' yards:

Textile cast	$10.00 to	$10.25
No. 1 machinery cast	10.00 to	10.25
Stove plate	6.25 to	6.50
Railroad malleable	11.00 to	12.00

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$8.00 to	$8.25
No. 2 heavy melting steel	6.75 to	7.00
Heavy melting steel (yard)	2.50 to	3.00
No. 1 heavy breakable cast	6.50 to	6.75
Stove plate (steel works)	5.25 to	6.00
Machine shop turnings	4.00 to	4.50
Short shoveling turnings	4.00 to	4.50
Cast borings	4.00 to	4.25
No. 1 blast furnace	4.00 to	4.25
Steel car axles	10.00 to	10.50
Spec. iron and steel pipe	$4.50 to	$5.00
Forge fire	5.50 to	6.00
No. 1 railroad wrought	6.50 to	7.00
No. 1 yard wrought, long	4.50 to	5.00
Rails for rolling	7.50 to	8.00
No. 1 cast	6.50 to	7.00
No. 2 cast	5.50 to	6.50
Stove plate (foundry)	6.00 to	6.50
Cast borings (chemical)	6.50 to	7.00

Per gross ton, delivered local foundries:

No. 1 machinery cast		$11.00
No. 1 hvy. cast (cupola size)		9.00
No 2 cast		7.00

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel	$9.25 to	$9.75
Scrap rails for melting	9.00 to	9.50
Loose sheet clippings	4.50 to	5.00
Bundled sheets	5.50 to	6.00
Cast iron borings	6.00 to	6.50
Machine shop turnings	5.50 to	6.00
No. 1 busheling	6.75 to	7.25
No. 2 busheling	3.00 to	3.50
Rails for rolling	9.50 to	10.00
No. 1 locomotive tires	8.25 to	8.75
Short rails	11.00 to	11.50
Cast iron carwheels	8.50 to	9.00
No. 1 machinery cast	9.50 to	10.00
No. 1 railroad cast	9.00 to	9.50
Burnt cast	6.75 to	7.25
Stove plate	6.75 to	7.25
Agricultural malleable	8.50 to	9.00
Railroad malleable	9.00 to	9.50

DETROIT

Dealers' buying prices per gross ton:

Hvy. melting steel	$9.50 to	$10.00
Borings and short turnings	6.75 to	7.25
Long turnings	5.75 to	6.25
No. 1 machinery cast	8.25 to	8.75
Automotive cast	10.00 to	10.50
Hydraul. comp. sheets	9.50 to	10.00
Stove plate	5.25 to	5.75
New No. 1 busheling	7.75 to	8.25
Old No. 2 busheling	5.75 to	6.25
Sheet clippings	6.25 to	6.75
Flashings	7.00 to	7.50

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$5.50	$5.50
Rails, scrap	6.00	4.50
Machine shop turnings	2.50	2.50
Boiler plate	4.50	4.50
Heavy axle turnings	2.50	2.50
Cast borings	3.00	3.00
Steel borings	2.00	2.00
Wrought pipe	2.50	2.50
Steel axles	4.50	6.00
Axles, wrought iron	4.50	6.50
No. 1 machinery cast	7.75	9.00
Stove plate	4.50	5.00
Standard carwheels	7.25	7.00
Malleable	6.75	7.00

Warehouse Prices for Steel Products

PITTSBURGH

	Base per Lb.
Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes	2.60c.
Reinforcing steel bars	2.60c.
Cold-finished and screw stock—	
Rounds and hexagons	2.95c.
Squares and flats	2.95c.
Hoops and bands, under ¼ in.	2.95c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.15c.
Galv. sheets (No. 24), 25 or more bundles	3.50c.
Hot-rolled sheets (No. 10)	2.50c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)	$3.32
Spikes, large	2.40c.
Small	2.65c.
Boat	2.90c.
Track bolts, all sizes, per 100 count,	70 per cent off list.
Machine bolts, 100 count,	70 per cent off list.
Carriage bolts, 100 count,	70 per cent off list.
Nuts, all styles, 100 count,	70 per cent off list.
Large rivets, base per 100 lb.	$3.25
Wire, black, soft ann'l'd, base per 100 lb.	2.90
Wire, galv. soft, base per 100 lb.	3.35
Common wire nails, per keg	2.45
Cement coated nails, per keg	2.45

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 999 lb.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.00c.
Soft steel bars	2.75c.
Reinforc. bars, billet steel	1.75c. to 1.90c.
Rail steel reinforcement	1.50c. to 1.65c.
Cold-fin. steel bars and shafting	
Rounds and hexagons	3.00c.
Flats and squares	3.50c.
Bands, 3/16 in. (in Nos. 10 and 12 gages)	2.95c.
Hoops (No. 14 gage and lighter)	3.50c.
Hot-rolled annealed sheets (No. 24)	3.45c.
Galv. sheets (No. 24)	4.10c.
Hot-rolled sheets (No. 10)	2.75c.
Spikes (3/16 in. and lighter)	3.45c.
Track bolts	4.30c.
Rivets, structural (keg lots)	3c.
Rivets, boiler (keg lots)	3c.
	Per Cent Off List
Machine bolts	65
Carriage bolts	65
Coach and lag screws	65
Hot-pressed nuts, sq., tap. or blank.	65
Hot-pressed nuts, hex., tap. or blank.	65
Hex. head cap screws	80 and 10
Cup point set screws	75
Flat head bright wood screws	50 and 10
Spring cotters	60 and 10
Stove bolts	80
Rd. hd. tank rivets, 7/16 in. and smaller	65
Wrought washers	$4.50 off list
No. 8 black ann'l'd wire per 100 lb.	$3.45
Com. wire nails, base per keg	2.55
Cement c't'd nails, base per keg	2.55

NEW YORK

	Base per lb.
Plates and struc. shapes	3.10c.
Soft steel bars, small shapes	3.10c.
Iron bars	3.24c.
Iron bars, swed. charcoal	6.00c. to 6.50c.
Cold-fin. shafting and screw stock;	
Rounds and hexagons	3.70c.
Flats and squares	4.29c.
Cold-roll. strip, soft and quarter hard	4.95c.
Hoops	3.30c.
Bands	3.30c.
Hot-rolled sheets (No. 10)	3.00c.
Hot-rolled ann'l'd sheets (No. 24*)	3.65c.
Galvanized sheets (No. 24*)	4.00c.
Long terne sheets (No. 24)	4.50c.
Standard tool steel	12.00c.
Wire, black annealed (No. 10)	3.60c.
Wire, galv. annealed (No. 10)	4.05c.
Tire steel ⅝ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open hearth spring steel, bases	4.50c. to 7.00c.
Common wire nails, base, per keg	$2.90
	Per Cent Off List
Machine bolt, cut thread:	
¾ x 6 in. and smaller	65 to 65 and 10
1 x 30 in. and smaller	65 to 65 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	65 to 65 and 10
¾ x 20 in. and smaller	65 to 65 and 10
Boiler tubes:	Per 100 Ft.
Lap welded, 2-in.	$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
Cold-fin. rounds, shafting, screw stock	3.36c.
Hot-rolled annealed sheets (No. 24)	3.60c.
Galv. sheets (No. 24)	4.00c.
Hot-rolled sheets (No. 10)	3.00c.
Black corrug. sheets (No. 24)	3.65c.
Galv. corrug. sheets	4.05c.
Structural rivets	3.00c.
Boiler rivets	3.00c.
	Per Cent Off List
Tank rivets, 7/16 in. and smaller.	
100 lb. or more	70
Less than 100 lb.	70
Machine bolts	65
Carriage bolts	65
Lag screws	65
Hot-pressed nuts, sq. blank or tapped, 200 lb. or more	65
Less than 200 lb.	55
Hot-pressed nuts, hex. blank or tapped, 200 lb. or more	65
Less than 200 lb.	55

PHILADELPHIA

	Base per Lb.
*Plates, ¼-in. and heavier	2.45c.
*Structural shapes	2.45c.
*Soft steel bears, small shapes, iron bars (except bands)	2.45c.
Reinforc. steel bars, sq., twisted and deform.	2.30c.
Cold-finished steel bars	3.35c.
*Steel hoops	3.00c.
*Steel bands, No. 12 to 3/16 in., incl.	2.75c.
Spring steel	5.00c.
†Hot-rolled annealed sheets (No 24)	3.15c.
†Galvanized sheets (No. 24)	3.50c.
*Hot-rolled annealed sheets (No. 10)	2.70c.
Diam. pat. floor plates, ¼ in.	5.00c.
Swedish iron bars	6.00c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

*Base prices subject to deductions on orders aggregating 4000 lb. or over.

†For 50 bundles or over.

CLEVELAND

	Base per Lb.
Plates and struc. shapes	2.95c.
Soft steel bars	2.75c.
Reinforc. steel bars	1.75c. to 2.35c.
Cold-fin. steel bars	2.95c.
Flat rolled steel under ¼ in.	3.00c.
Cold-finished strip	5.55c.
Hot-rolled annealed sheets (No. 24)	3.25c.
Galvanized sheets (No. 24)	3.85c.
Hot-rolled sheets (No. 10)	2.75c.
Black ann'l'd wire, per 100 lb.	$2.55
No. 9 galv. wire, per 100 lb.	2.90
Com. wire nails, base per keg	2.35

*Net base, including boxing and cutting to length.

CINCINNATI

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
New billet reinforc. bars	3.00c.
Rail steel reinforc. bars	3.00c.
Hoops	3.75c.
Bands	3.20c.
Cold-finished bars	3.32c.
Hot-rolled annealed sheets (No. 24)	3.60c.
Galv. sheets (No. 24)	4.15c.
Hot-rolled sheets (No. 10)	3.05c.
Structural rivets	4.00c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (10 to 49 kegs)	2.65
Larger quantities	2.50
Cement c't'd nails, base 100-lb. keg	2.95
Chain, 1-in., per 100 lb.	6.00
	Net per 100 Ft.
Seamless steel boiler tubes, 2-in.	$15.87
4-in.	34.57
Lap-welded steel boiler tubes, 2-in.	15.12
4-in.	32.96

BUFFALO

	Base per Lb.
Plates and struc. shapes	3.20c.
Soft steel bars	2.95c.
Reinforcing bars	2.95c.
Cold-fin. flats and sq.	3.00c.
Rounds and hex.	3.00c.
Cold-rolled strip steel	5.25c.
Hot-rolled annealed sheets (No. 24)	3.25c.
Galv. sheets (No. 24)	4.00c.
Bands	3.00c.
Hoops	3.55c.
Hot-rolled unannealed sheets	3.10c.
Com. wire nails, base per keg	$2.75
Black wire, base per 100 lb.	3.00

BOSTON

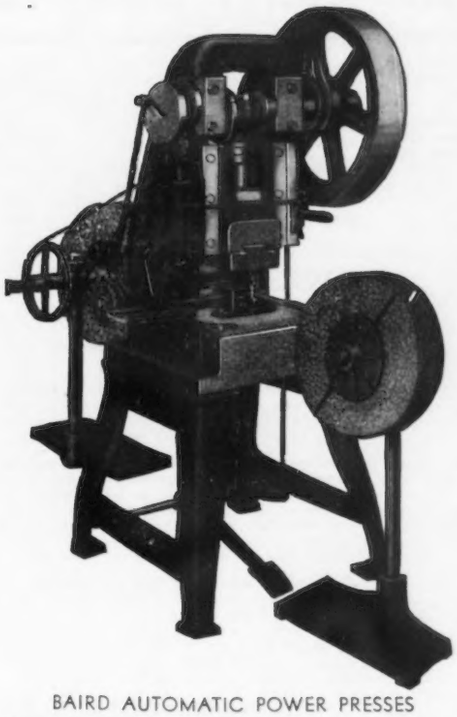
	Per Lb.
*Beams, channels, angles, tees, zees	2.60c.
*H beams and shapes	2.60c.
*Plates—sheared, tank and univ. mill, ¼ in. thick and heavier	2.60c.
*Floor plates, diamond pattern	4.50c.
*Bar and bar shapes (mild steel)	2.50c.
*Bands 3/16 in. thick and No. 12 ga. incl.	3.50c.
Hoops, No. 14 ga. and lighter	4.90c. to 5.40c.
*Half rounds, half ovals, ovals and bevels	3.75c.
Tire steel, rd. edge 1½ x ⅛ in. and larger	4.50c.
Smaller sizes	4.75c.
Cold-finished rounds and hexagons	3.60c.
Cold-rolled strip steel	5.20c.
Cold-finished squares and flats	4.10c.
*Blue annealed sheets, No. 10 ga.	2.45c.
One pass cold-rolled sheets No. 24 ga.	3.50c.
Blued stove pipe sheets, No. 24 ga.	3.90c.
Galvanized steel sheets No. 24 ga.	4.00c.
Lead coated (long ternes) No. 24 ga.	5.00c.
Black wire, base per 100 lb., 2500 lb. or less	3.35c.
Over 2500 lb.	3.25c.

Base prices for 40,000 lb. orders; extra apply for smaller quantities.

PACIFIC COAST

	Base per Lb.		
	San Francisco	Los Angeles	Seattle
Plates, tank and U.M.	2.80c.	3.30c.	3.15c.
Shapes, standard	3.15c.	3.30c.	3.15c.
Wide-flanged beams and columns	3.25c.	3.30c.	3.50c.
Soft steel bars	3.15c.	3.30c.	3.15c.
*Reinforcing bars	2.90c.	3.00c.	3.15c.
Hot-rolled annealed sheets (No. 24)	3.95c.	4.20c.	4.50c.
Hot - rolled sheets (No. 10)	3.33c.	3.80c.	3.75c.
Galv. sheets (No. 24)	4.55c.	4.50c.	5.00c.
*Struc. rivets, ½ in. and larger	5.75c.	6.00c.	5.25c.
*Cold finished steel Rounds	5.50c.	5.50c.	4.50c.
Squares and hexagons	6.75c.	6.75c.	5.75c.
Flats	7.25c.	7.25c.	6.75c.
Common wire nails —base per keg	$2.65	$2.55	$2.70
less carload			

*Subject to deductions for quantity.



BAIRD AUTOMATIC POWER PRESSES

PRODUCTION...
AND THE RECOVERY ACT

At the present writing the exact manner in which the Recovery Act will function is somewhat vague, but the basic idea of curtailed hours and minimum wage rates suggests the need for getting the maximum production out of a machine while it is running in order to keep costs in line. You can't do this by building your own machines because this surely would involve too high an original investment. You can't do it by continuing the operation of inefficient machines.

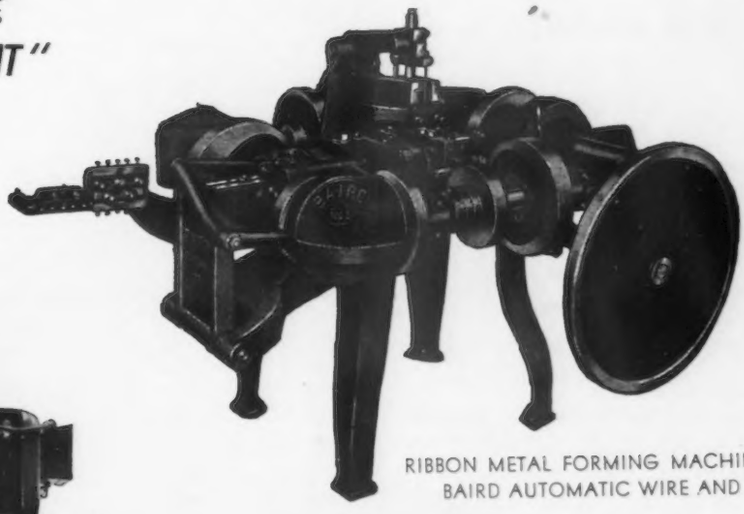
But you *can* do it by coming to Baird for your machines where you get the full benefit of our more than 60 years experience in building production machinery. On this page are four Baird machines equal to the demands of the day. To show all Baird machines would require many pages. How may we cooperate with *you?*

THE BAIRD MACHINE COMPANY

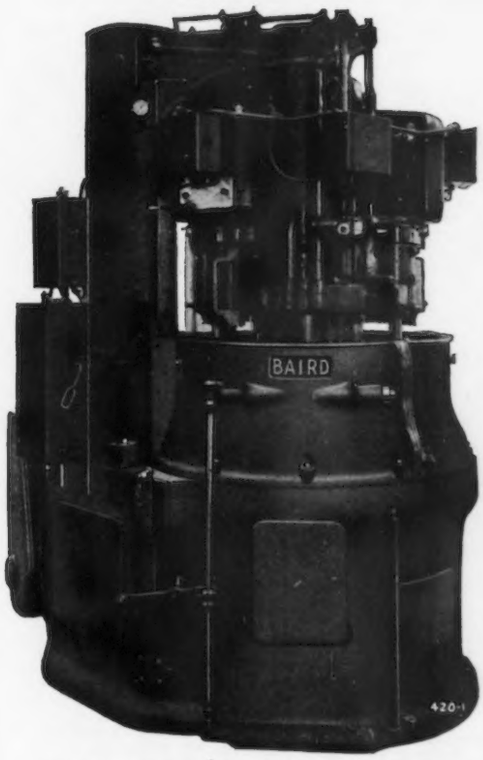
BRIDGEPORT, CONN.

"ASK BAIRD ABOUT IT"

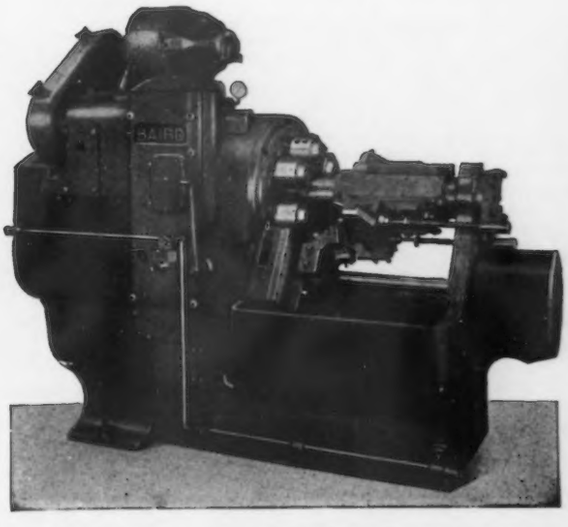
AUTOMATIC BAIRD MACHINERY



RIBBON METAL FORMING MACHINES
BAIRD AUTOMATIC WIRE AND



BAIRD AUTOMATIC MULTIPLE SPINDLE
INTERNAL GRINDERS



BAIRD AUTOMATIC HORIZONTAL AND VERTICAL
MULTIPLE SPINDLE LATHES

PLANT EXPANSION AND EQUIPMENT BUYING

NEW ENGLAND

Strand Enamel Works, Inc., Winsted, Conn., recently organized by Ralph E. Strand, 151 Main Street, to manufacture enameled wire and kindred specialties, has acquired property on Torrington Road for new plant. Initial unit will be one-story, 40 x 65 ft.

Croft Brewing Co., Roxbury Crossing, Boston, operating former brewing plant of Highland Spring Brewery, where expansion to cost over $200,000 will be carried out, has acquired controlling interest in Standard Brewery, Inc., Curtis Bay district, Baltimore, and will operate as branch plant with capacity of 150,000 bbl. a year. Subsidiary is being organized under name of Bismarck Brewing Co., to operate Baltimore plant. R. P. Bischoff is president of parent organization.

Yankee Metal Works, Inc., Malden, Mass., has been organized by Elbridge G. Huff and William E. Albee, 14 Irving Street, Melrose, Mass., to manufacture metal goods.

Colonial Beacon Oil Co., 20 Providence Street, Boston, has let general contract to Leo J. Nawn, Inc., Magazine Street, Roxbury, for new bulk oil storage and distributing plant at Pittsfield, Mass. Cost over $35,000 with tanks and equipment.

Ameroil Burner Mfg. Corpn., Hartford, Conn., has been organized by Gabriel Grobard and Alexander Miller, 380 Windsor Street, capital $50,000, to manufacture oil burners and oil-burning equipment.

NORTH ATLANTIC

F. & M. Schaefer Brewing Co., 2 South Ninth Street, Brooklyn, has filed plans for multi-story addition to present eight-story plant on Kent Avenue. New equipment will be installed. Cost about $340,000 with machinery. A. M. Entenman is company architect.

Kabro Oil Co., 1765 Dahill Road, Brooklyn, has plans for one-story addition to oil processing, storage and distributing plant. Cost about $25,000 with equipment. I. Kallich, 375 Fulton Street, is architect.

Webster Engineering Co., 84 William Street, New York, manufacturer of steel bellows, etc., has leased part of building at Fortieth Avenue and Twenty-first Street, Long Island City, for new plant.

Houghton-Brown Co., Inc., Albany, N. Y., has been organized by George E. Hougton and Alan G. Brown, 212 Lancaster Street, to manufacture machinery and tools.

Continental Can Co., 1 Pershing Square, New York, will build new plant unit at Seattle. Cost about $140,000 with equipment.

Signal Supply Officer, Army Base, Brooklyn, asks bids until Aug. 7 for 18 test sets (Circular 3); until Aug. 15, 75 dynamotor units (Circular 4).

National Distillers Products Corpn., 52 William Street, New York, plans expansion in production facilities, and will build and acquire plants in different parts of country. Company is arranging increase in capital, proceeds to be used for purpose noted. Purchase will soon be carried out of Overholt Distributing Co. plants at Broad Ford and Large, Pa., to be extended and improved, including additional equipment.

Carteret Storage & Terminal Co., Carteret, N. J., recently organized subsidiary of General American Transportation Corpn., Chicago, Lester N. Selig, president, and its terminal operating company, General American Tank Storage & Terminal Co., New York, has plans for additions to bulk oil storage and distributing plant of American Mineral Spirits Corpn., Carteret, lately acquired. Initial unit will comprise battery of three large steel tanks and mechanical-handling equipment. Cost about $100,000 with equipment. Other units will be built later. Cost over $500,000 with equipment.

Commercial Solvents Corpn., 230 Park Avenue, New York, has arranged for purchase of large part of properties of Rossville Alcohol & Chemical Corpn., Lawrenceburg, Ind., including two plant units at Westwago, La., and Agnew, Cal., and plans expansion for production of grain alcohol. New units for such product will be established at commercial alcohol works of purchasing company at Terre Haute, Ind., with storage and distributing facilities. Certain departments of Rossville company will be removed to Terre Haute.

Delta Railway Safety Appliance Corpn., Newark, N. J., has been organized under direction of Saul Bressel, 1060 Broad street, by Arnold A. Eisen, Newark, and associates, capital $25,000, to manufacture railway safety devices and equipment.

Red Bank Brewing Co., Red Bank, N. J., Nicholas La Vecchia, 60 Park Place, Newark, N. J., representative, recently organized, capital $125,000, has leased plant of Seaboard Ice Co., Red Bank, five stories and basement, and will build addition, with improvements in present unit. Cost over $70,000 with equipment.

John F. Betz & Sons, Inc., Philadelphia, recently organized, has acquired old brewery at Willow and Lawrence Streets, and will remodel for new plant. Cost over $75,000 with machinery. Clarence E. Wunder, Architects' Building, is architect.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Aug. 8 for 11 metal propeller hubs (Schedule 443); until Aug. 15, 23,500 sq. ft. copper nickel alloy wire cloth (Schedule 422), and 400 air-speed indicators (Schedule 439) for Philadelphia Navy Yard.

Borough Council, Shippensburg, Pa., plans installation of pumping machinery, pipe lines, etc., for new water supply system from North Mountain district. Cost over $100,000 with equipment.

Pottstown Water Co., Pottstown, Pa., plans improvements in pumping plant at Bramcote, near Pottstown, including new equipment.

Board of Education, duPont Building, Wilmington, Del., plans call for bids on general contract early in September for new Pierre S. duPont High School to include complete manual training department. Cost over $1,000,000. E. William Martin, duPont Building, is architect.

BUFFALO DISTRICT

Tonawanda Brewing Corpn., Tonawanda, N. Y., has been organized, capital $400,000, by Frank X. Schwab, Walbridge Building, Buffalo, and associates, to take over former Schwab Brewery, Tonawanda, and will expand for new plant. Company has arranged financing in amount of $264,875, part of fund to be used for purpose noted. Carl H. Berets, C. H. Berets Co., 120 Wall Street, New York, is interested in new organization.

Superior Foundry, Inc., Buffalo, has been organized by Chester H. Long, 24 Ross Avenue, Buffalo, and David O. Redinbaugh, 31 Zimmerman Boulevard, Kenmore, N. Y., to manufacture iron and other metal castings.

National Radiator Corpn., Johnstown, Pa., has developed a new type oil-burning boiler, and contemplates quantity production, reopening branch plants at North Tonawanda and Dunkirk, N. Y., closed about a year ago. Normally, plants noted employ about 1000 men.

Huron Portland Cement Co., Ford Building, Detroit, plans new mill at Oswego, N. Y., including storage and packing units. Cost close to $175,000 with equipment.

WESTERN PENNA.

DuBois Brewing Co., DuBois, Pa., has plans for addition for bottling works. Cost about $100,000 with equipment. Frank J. Hahne, Jr., is president.

Hookless Fastener Co., Meadville, Pa., manufacturer of metal fasteners, etc., has engaged Wilbur Watson & Associates, 4614 Prospect Avenue, Cleveland, architects, to draw plans for one-story addition, 60 x 300 ft. Cost over $150,000 with equipment. Herbert R. Walrath is vice-president and plant manager.

Sloan & Zook Co., Bradford, Pa., plans extensions and improvements in branch oil refinery at Warren, Pa., acquired a few months ago. Installation will include new steel and auxiliary equipment to more than double present capacity. Cost over $100,000 with machinery.

Friars, Inc., Irwin, Pa., recently organized, has acquired former Irwin Brewery, and will expand for new plant. Cost over $60,000 with machinery. B. H. Mulvihill is one of heads of new company.

Republic Brewing Co., Republic, Pa., has plans for extensions and improvements, including one-story bottling works. Cost over $80,000 with equipment. J. Davies, 53 Connellsville Street, Uniontown, Pa., is in charge.

Island Creek Coal Co., Huntington, W. Va., plans new steel dock, about 240 ft. long, for storage and distribution. Cost over $65,000 with mechanical handling equipment, etc.

WASHINGTON DISTRICT

United States Engineer Office, Navy Building, Washington, asks bids until Aug. 10 for one motor-driven rotary vacuum pump (Circular 6).

National Brewing Co., 3702 O'Donnell Street, Baltimore, has plans for four-story addition, 50 x 105 ft., and will soon begin superstructure. Cost over $75,000 with equipment.

Bureau of Lighthouses, Washington, has secured appropriation under new Public Works Bill, for improvements in mechanical shop at Portsmouth, Va., and installation of machinery, $24,000; also, $35,000 for new fog signal testing plant at Point Lookout, Md. Bids soon asked.

General Purchasing Officer, Panama Canal, Washington, asks bids until Aug. 8 for steel machine bolts, machine bolt nuts, black stove bolts, brass or bronze pipe fittings, 4000 lb. iron or steel washers, 33,000 spring lock washers, cable clips for wire rope, chain shackles, etc. (Schedule 2889).

Appalachian Electric Power Co., Roanoke, Va., plans extension and improvements in power plant and system at Lynchburg and vicinity. Cost about $70,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Aug. 8 for forced draft blowers and spare parts (Schedule 408), air reducing valves and spare parts (Schedule 436); until Aug. 15, machine screws and nuts, wood screws (Schedule 455) for Eastern and Western yards; eight motor-driven circular saws (Schedule 457) for Brooklyn, Philadelphia, Mare Island and Puget Sound yards; until Aug. 8, 2,337,000 lb. steel plates (Schedule 465-R), 172,000 lb. steel I-beams, 32,000 lb. steel channels, 161,000 lb. steel angles, 124,000 lb. steel bulb angles and 15,000 lb. steel tees (Schedule 466-R) for Portsmouth, N. H., Navy Yard.

SOUTH ATLANTIC

F. E. Golian Steel & Iron Co., East Point, Atlanta, Ga., plans two new one-story shop units, 60 x 72 ft., and 25 x 42 ft., for machine shop and mechanical service.

Cartersville Mills, Inc., Cartersville, Ga., has plans for steam power plant, 26 x 45 ft., in connection with addition to textile mill, 75 x 100 ft. Entire project will cost over $40,000 with equipment. Robert & Co., Inc., Bona Allen Building, Atlanta, Ga., is architect and engineer.

Palmer Stone Works, Albemarle, N. C., C. M. Palmer, head, has plans for one-story shop, 90 x 400 ft., for cutting, finishing and auxiliary service. Cost about $30,000 with equipment.

Common Council, Clearwater, Fla., plans municipal electric light and power plant. Cost over $100,000 with equipment. H. H. Baskin, mayor, is active in project.

Tidewater Stone Co., Tarpon Springs, Fla., Leon F. Fernald, president, plans installation of additional equipment for sawing, planing, polishing and other service.

SOUTH CENTRAL

Heidelberg Brewing Co., 600 Madison Avenue, Covington, Ky., will soon take bids for two, three and four-story brew-house and bottling plant, one-story boiler plant and other units. Installation will include brewing, bottling, refrigerating and other mechanical equipment, tanks, etc. Cost about $300,000. Richard Griesser & Son, 64 West Randolph Street, Chicago, are architects.

Spartan Refining Co., Shreveport, La., subsidiary of Atlas Pipe Line Co., same place, has approved plans for new oil refinery with

"WHAT'S THE MATTER, JACK? THOUGHT THE DEPRESSION WAS OVER"
"I'M IN A HOLE. WE'RE GETTING COMPLAINTS ON OUR FINISH. COME ON DOWN TO THE PLATNG ROOM. I'LL SHOW YOU
"LOOK AT THAT. WHAT WOULD YOU SUGGEST?"
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"THE UDYLITE PROCESS CAN HELP YOU. ITS A SIMPLE AND EASY METHOD OF APPLYING UDYLITE-CADMIUM A FINISH THAT PREVENTS RUST HAS A NICE APPEARANCE AND COSTS LESS THAN YOU ARE NOW PAYING"
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TWO WEEKS LATER
"HELLO, JACK. HOW'S —"
"BOY, LET'S GO DOWN TO THE PLATING ROOM. WE'VE GOT UDYLITE NOW. I WANT TO SHOW YOU A FINISH THAT'S A REAL FINISH
"SURE IS GREAT, JACK. BET THERE ARE NO KICKS NOW"
"RIGHT! LOOK AT THAT! SPEAKS FOR ITSELF DOESN'T IT? UDYLITE WORKS LIKE A CHARM I GET A BRIGHT LUSTROUS FINISH, AND SAY, DOES IT PREVENT RUST. I'M SAVING MONEY TOO

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units for gasoline production. Cost $1,000,000 with machinery.

Hampton Cracker Co., Thirtieth and Magazine Streets, Louisville, has plans for four-story addition to food products and baking plant. Cost over $50,000 with ovens, conveyors and other equipment. E. B. Davis, Columbia Building, is architect.

Common Council, Many, La., plans municipal electric light and power plant. Cost over $50,000 with equipment. Swanson-McGraw, Inc., Balter Building, New Orleans, La., is consulting engineer.

Common Council, West Monroe, La., plans installation of pumping machinery and auxiliary equipment for waterworks extensions, including pipe lines, etc. S. E. Huey and C. C. Peerman, Monroe, La., are consulting engineers.

SOUTHWEST

Louis Obert Brewing Co., 2700 South Twelfth Street, St. Louis, has let general contract to Voepel Building Co., 1113 Sidney Street, for extensions and improvements in two and three-story plant. Cost close to $100,000 with machinery. George Paukau, Arcade Building, is architect.

Tulsa Brewing Co., Beacon Life Building, Tulsa, Okla., M. J. McNulty, Jr., 1653 East Twelfth Street, president, recently organized, has let general contract to Daniel Tankersley, 1607 East Twelfth Street, for initial unit of new plant, multi-story type, 80 x 210 ft. Cost $400,000 with equipment. A. M. Atkinson, Thompson Building, is architect.

City Council, Kennett, Mo., has called special election Aug. 9 to approve bond issue of $140,000 for new municipal electric light and power plant.

Empire Ice & Storage Co., Guinotte and Prospect Streets, Kansas City, Mo., R. W. Gees, president, has plans for remodeling part of plant for brewery. Cost over $85,000 with equipment. Henrici-Lowry Engineering Co., 114 West Tenth Street, is architect and engineer.

Sarita Metals Corpn., 311 Commerce Building, Kansas City, Mo., has been organized by H. J. Penney, 1101 Tennessee Street, Lawrence, Kan., and L. W. Jeffords, Kansas City, to manufacture metal products.

Crescent Brewing Co., Joplin, Mo., care of T. E. Martinie, Miners' Bank Building, architect, recently organized, plans early call for bids on general contract for five-story and basement plant, 150 x 300 ft., with power house, machine shop and other units. Cost over $375,000 with equipment. Carl Meyers is secretary.

Southern Brewing Co., Houston, Tex., A. M. Arnold, 2007 Gano Street, recently organized, has plans for first unit of new plant, three stories and basement, 95 x 100 ft., with storage and distributing plant adjoining. Cost over $100,000 with equipment.

City Council, Austin, Tex., plans installation of pipe lines, pumping machinery and other mechanical equipment for extensions and improvements in municipal waterworks. Cost about $896,000. Plans are also under consideration for new municipal electric light and power system, to cost $700,000 with equipment. Financing is being arranged.

MIDDLE WEST

Union Brewing Co., 4170 South Union Street, Chicago, has asked bids on general contract for extensions and improvements. Cost over $80,000 with equipment. Fred E. Gatterdam, 900 Eastman Street, is architect.

Wire Products Mfg. Co., 1722 West Adams Street, Chicago, has been organized by Morton J. Pinz and Samuel M. Lanoff, to manufacture wire goods.

Star Brewing Co., Dubuque, Iowa, has work under way on extensions and improvements, to include new equipment. Cost over $65,000 with machinery.

Common Council, Hope, N. D., plans new municipal electric light and power plant. Cost about $50,000 with equipment. Financing is being arranged.

Bureau of Reclamation, Denver, asks bids until Aug. 25 for one 120-in. diameter and four 168-in. diameter butterfly valves, with complete operating mechanisms, or as an alternative, two valves of first noted size and 11 168-in. butterfly valves, for Boulder power plant, Boulder Canyon, Nev. (Specification 544).

Sprague Foundry & Mfg. Co., 230 South Eleventh Street, Council Bluffs, Iowa, manufacturer of iron castings, etc., has awarded general contract to Peter Peterson, 3413 California Street, Omaha, Neb., for one-story and basement foundry, 76 x 105 ft., to replace unit recently destroyed by fire.

Air Conditioning Industries, Inc., Chicago, Wayne D. Jordan, president, recently organized to manufacture air-conditioning equipment for domestic and commercial service, has acquired controlling interest in Air Control Systems, Inc., 2240 North Racine Avenue, manufacturer of humidifiers, parts, etc., and will operate as an affiliated interest. Purchasing company has arranged for sale of stock, totaling about $420,000, part of fund to be used for expansion.

Board of Education, Ames, Iowa, plans manual training department in new high school to cost $200,000. Financing is being arranged. Tinsley, McBroom & Higgins, Hubbell Building, Des Moines, Iowa, are architects.

Pillsbury Flour Mills Co., Metropolitan Life Building, Minneapolis, plans addition to grain storage elevator plant at Springfield, Ill. Cost over $200,000 with elevating, conveying and other equipment.

Washerless Faucet Co., Cairo, Neb., has been organized by William Thaete, Ernest Nunnencamp and associates, Cairo, to manufacture special faucets and kindred products.

MICHIGAN DISTRICT

Pfeiffer Products Co., 3700 Beaufait Avenue, Detroit, has sold former brewery to new interests, headed by F. J. Conrad, Chicago, and Carleton S. Smith, Detroit, formerly secretary-treasurer, Copeland Refrigerator Co., same city. New company will be organized. Plans are under way for extensions and improvements, including new, multi-story unit. Cost over $250,000 with machinery, tanks, etc. Mr. Smith will be secretary-treasurer of company.

Kalamazoo Paper Co., Kalamazoo, Mich., plans extensions and improvements, including new machinery. Cost about $125,000 with equipment.

Tillson Bearing Corpn., L'Anse, Mich., has been organized by Chauncey St. Germain, Baraga, Mich., to manufacture bearings and other mechanical equipment.

Yale Electric Products Co., Bay City, Mich., has perfected new oil burner, and quantity production will be carried out at plant of Industrial Brownhoist Corpn., which is interested in new product, to be known as Tru-Fire burners.

Acme Metal Etchings Co., Detroit, recently organized, has taken over Acme Etched Products Co. and has acquired larger quarters at 4857 St. Aubin Street. M. L. Snyder is president and H. L. Ebbers, vice-president.

OHIO AND INDIANA

John Rutkowski, Inc., 5208 Harvard Avenue, Cleveland, is at head of project to erect six-story and basement brewery, 75 x 125 ft. Cost over $175,000 with equipment. F. Hronek, address noted, is architect and engineer.

Gund Realty Co., 1476 Davenport Avenue, Cleveland, has plans for new steam power plant for central heating for group of buildings, with boilers, stokers and auxiliary equipment, pipe lines, etc. Cost about $30,000. Mayer & Valentine, Plymouth Building, are engineers.

Contracting Officer, Material Division, Wright Field, Dayton, Ohio, asks bids until Aug. 8 for strut assemblies, joint landing gear rear strut balls, tail wheel axle bolts, landing gear oleo plunger shaft ends, 40 axle tail wheels, 70 tail wheel fork axle spacers and other equipment (Circular 8); until Aug. 22, 295 propeller blades (Circular 9).

Jordan Welding & Mfg. Co., Inc., Cleveland, has been organized by William, Roland R. and Sidney W. Jordan, to manufacture mechanical equipment, welding products, etc., and will take over company of similar name at 2120 West Forty-fifth Street.

Cincinnati Sheet Metal & Roofing Co., 1707 Eastern Avenue, Cincinnati, has let general contract to M. J. Roche Construction Co., Shaw Street, for one-story addition, 88 x 244 ft. Howard McClorey, Gerke Building, is architect.

City Council, Hamilton, Ohio, plans installation of pumping machinery and other equipment for waterworks expansion and water-softening plant. Cost over $900,000. Financing being arranged. R. P. Price is city manager, in charge.

Kiley Brewing Co., Inc., Marion, Ind., recently organized, capital $750,000, will soon take bids for additions and improvements, with brew-house, bottling and other equipment. Cost over $75,000 with machinery. Robert P. and Philip J. Kiley are heads.

Starr Mfg. Corpn., Connersville, Ind., has been organized by Adolph and William R. Starr, Connersville, to manufacture piston rings and kindred automotive products.

Centlivre Brewing Corpn., Fort Wayne, Ind., has arranged for sale of 200,000 shares common stock, part of proceeds to be used for expansion. Plans are under way for extensions and improvements in power house, including additional equipment. R. W. Noland, Medical Arts Building, is architect.

Emge Packing Co., Fort Branch, Ind., Oscar Emge, manager, meat packer, has let general contract to Chris Kanzler & Son, Furniture Building, Evansville, Ind., for addition, including one-story power house. Cost about $100,000 with equipment. H. Peter Henschien, 24 East Van Buren Street, Chicago, is architect and engineer.

Square Deal Coal Mining Co., Boonville, Ind., plans rebuilding tipple at local coal properties, recently destroyed by fire.

PACIFIC COAST

Sainte Claire Brewing Co., Lincoln Avenue, San Jose, Cal., will soon begin extensions and improvements, to include new brew-house, bottling and other machinery. Cost about $250,000 with equipment. Frank J. McCarthy, 501 Vicente Street, San Francisco, is in charge.

City Council, Brawley, Cal., is considering erection of a municipal electric-operated ice-manufacturing plant. Cost about $200,000 with machinery.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Aug. 8 for 42,600 ft. steel wire rope (Schedule 447), 350 vacuum tubes (Schedule 448), 16,000 lb. naval brass (Schedule 434), 4350 lb. corrosion-resisting bar steel (Schedule 435), six refrigerating equipments and spare parts (Schedule 432) for Mare Island Navy Yard; 1700 lb. corrosion-resisting steel welding electrodes (Schedule 424), eight centrifugal ventilating sets (Schedule 431) for Puget Sound yard; 52,000 lb. galvanized flat sheet steel (Schedule 427); until Aug. 15, 6100 lb. iron and steel welding electrodes (Schedule 441) for San Diego yard.

Standard-Remote Control Valve Co., Los Angeles, has been organized under direction of C. A. Balbreich, Bartlett Building, by George W. Somerville, Los Angeles, and Otto C. Beck, Bell, Cal., to manufacture valves and kindred products.

Board of Education, Corvallis, Ore., plans manual training department in new high school. Cost about $300,000. Financing is being arranged.

Century Brewing Co., Seattle, care of Joseph Wohleb, Chambers Building, Olympia, Wash., let general contract to A. W. Quist Co., Exchange Building, Seattle, for extensions and improvements in plant at 3100 Airport Way, last noted city, lately acquired. New equipment will be installed. Cost about $100,000 with machinery.

Woodbridge Winery, Inc., Oliver Ziegler, 622 Seventeenth Street, Sacramento, Cal., president, plans new works at Lodi, Cal. Cost $100,000 with machinery, power house, machine shop and other structures.

Columbia Brewing Co., 500 Lane Mortgage Building, Los Angeles, Schuyler H. Williams, president, has plans by W. Harry Hillier, 3016 West Vernon Avenue, architect and engineer, for new plant at South Gate. Cost over $400,000 with machinery.

FOREIGN

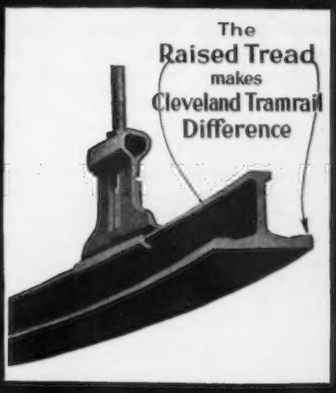
Societe Generale des Etablissements de Bergougnan, Ltd., Clermont-Ferrand, France, manufacturer of solid rubber tires, mechanical rubber goods, etc., has closed contract with Seiberling Rubber Co., Akron, Ohio, for manufacture of pneumatic automobile tires under Seiberling patents. New machinery will be purchased in United States and installation made at Bergougnan plant early in fall. Cost over $150,000. K. B. Kilbourne, chief engineer, Seiberling company, will supervise expansion. Auguste Saure is in charge of factory operations at Bergougnan mill.

Rhokana Corpn., Ltd., London, England, plans new electrolytic copper refinery at N'Kana mining properties, South Africa. Cost over $600,000 with machinery.

Administrative Control of National Petroleum, Mexico, D.F., Construction Division, has secured authority from Ministry of National Economy to erect new oil refinery at Atzcapotzalco, with bulk storage and distributing facilities. Cost over $200,000 with machinery.

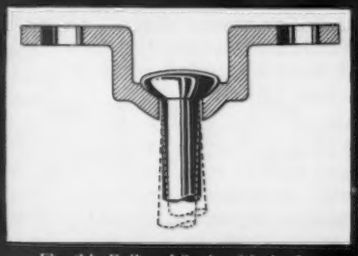
PIONEERING EXPERIENCE and the vision to apply this experience in the development of new devices to meet the need of manufactured progress and changes. Filling the gap with new sizes and types, but maintaining the original basic principals which have proven over years of service to be correct---such has been the Cleveland Tramrail Organization.

Pictured below are some of the original principles which through years of service have proven Cleveland Tramrail to be basically correct.

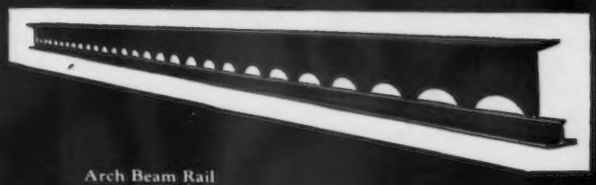


A one piece rail rolled specially and used exclusively as the track for Cleveland Tramrail systems, having a raised tread or wearing strip which prevents peining or bending down of the rail flange.

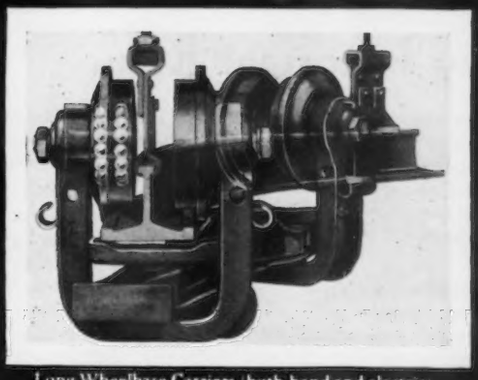
This same rail is used in forming Cleveland Tramrail Arch Beam Rail.



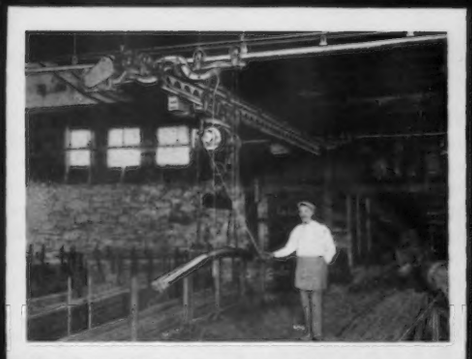
Flexible Ball and Socket Method of Suspending Rail.



Arch Beam Rail



Long Wheelbase Carriers (both hand and electric) with Full Ball Bearing Wheels and Swivel Yokes.



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The same Rail and Suspension Fittings are used for both hand and electrically operated systems.

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CLEVELAND
HAND OR ELECTRIC TRAMRAIL

Heat-Resisting Steels of the Present Day

(*Concluded from Page 29*)

this defect has somewhat restricted the use of these steels, but it may now be said that practical inhibition of this type of corrosion has been achieved. It is fully expected that the 18 per cent chromium-8 per cent nickel steels will find more diversified applications in the near future.

Steels containing 22 to 25 per cent chromium and 10 to 15 per cent nickel have found many uses as castings and rolled products, resisting corrosion and creep as well as the oxidation encountered at temperatures as high as 1000 deg. C. In the manufacture of cotton cloth this steel has given good service in the form of singe rolls, which operate at temperatures in the neighborhood of 800 or 900 deg. C. and are used to burn fibers from the surface of the cloth. Castings of these steels have served satisfactorily as liners for kilns and feed pipes in the manufacture of cement, as well as in the form of furnace parts not required to operate in high-sulphur atmospheres.

Steels with still higher nickel contents, and more than 20 per cent of chromium, have given excellent service in the hydrogenation of oils under high pressures and at elevated temperatures. The widespread interest in the hydrogenation of petroleum warrants mention that operating practice has recently reached a pressure of 3600 lb. per sq. in. and temperatures between 400 and 600 deg. C. It is safe to say that commercial operation under such severe conditions is absolutely dependent on the high-chromium, high-nickel steels having great strength at elevated temperatures and an adequate resistance to flame oxidation.

In the cast form steels containing 30 to 35 per cent nickel and 15 to 20 per cent chromium have shown some remarkable properties. It is generally recognized that such compositions are probably the strongest known at extremely high temperatures.

Centrifugal casting of all the high-chromium steels is a recent development promising great progress. This process makes possible the casting of large tubes from compositions which at present cannot be fabricated into seamless tubing. Larger tubes have been made in this manner than those obtainable from the high-chromium steels capable of being pierced into seamless tubes. Recently several tubes were successfully cast from a steel containing approximately 25 per cent chromium, 12 per cent nickel, and 0.30 per cent carbon. These tubes had a diameter of 13 in., a wall thickness of ⅝ in., a length of 12 ft., and they were installed in a chemical process operating at 1000 deg. C.

Iron-Silicon Alloys Play Important Role

SOMETHING of the importance of iron-silicon alloys to our modern industrial civilization is outlined in the announcement of a new book by the iron alloys committee of the Engineering Foundation, New York. This book, on "The Alloys of Iron and Silicon," is expected to be ready by Sept. 1; it is the second of a series, the premier volume having been "The Alloys of Iron and Molybdenum," published in December, 1932.

There are three classes of iron silicon alloys, namely the silicon structural steels, the silicon electric steels, and the silicon acid-resisting irons, states the report.

Silicon structural steels combine relatively high strength with a cost but slightly greater than that of ordinary structural steel. In some types of construction, especially in large bridges, use of silicon steels makes possible a stronger structure with no increase in weight, or a lighter structure with no decrease in strength. Silicon structural steels were first used widely in Germany and in England; as early as 1907 silicon steel was employed in the construction of the ocean liners Lusitania and Mauretania. In the United States this steel has been widely used, especially in the past ten years, for large bridges. In the George Washington Memorial bridge across the Hudson River, one-third of the total steel used or, if the cables are not considered, nearly 50 per cent of the total structural steel, contains silicon as an alloy.

Although very important on account of its high strength and low cost, silicon structural steel is not indispensable, it is pointed out. Other alloy steels have equally good properties, but they cost more. There is, however, one material, silicon electric steel, which is indispensable and without which our civilization could not have progressed to its present state of development.

The invention of silicon steel, which was later to be used in the construction of electric machinery, was the result of epochal research work carried out by Sir Robert Hadfield in England during the years 1880 to 1895, in which an extensive series of new steels was developed. It was not until after 1900 that it was discovered that silicon steel had remarkable electric and magnetic properties. Credit for the discovery of these properties and for the development of silicon electric steel must go to a large number of American, German, and British scientists who, working independently, perfected the new material so that by 1915 a complete revolution in the manufacture of electric machinery had taken place. This development is still going on.

The value of silicon electric steel to our civilization cannot be overestimated, according to engineers. Use of this steel in electric machinery has cut energy losses in half; the saving to the consumers in the United States alone is estimated conservatively at more than $10,000,000 a year. In the past 20 years users of electric current throughout the civilized world have saved nearly $500,000,000.

In another very important field, the chemical industry, an alloy of iron and silicon is indispensable. It is used in the manufacture of sulphuric acid and nitric acid, which are raw materials for a large number of fertilizers, for nearly all of our explosives, and for many other chemicals and drugs.

Until 20 years ago the chemical industry was forced to use expensive platinum and fragile glassware or stoneware for the manufacture of sulphuric acid and nitric acid. In 1912 it was discovered, almost simultaneously in the United States, England, and Germany, that by adding one part of silicon to six parts of iron, melting this mixture, and pouring into castings, a material could be obtained which was unaffected by either of these strongly corrosive acids. The result of this discovery was far-reaching.

Chart for Selecting Nickel Alloy Steels

INTERNATIONAL Nickel Co., Inc., has developed a circular "slide rule" chart that shows at a glance the nickel alloy steel compositions and treatments required to develop yield points up to 175,000 lb. per sq. in. in section sizes varying from 1 to 12 in. The figures given are based on numerous tests, and may be used as a general guide to the selection of steels for bars, shafting and forgings of single shape.

So far as is known, this is the first time that reasonably complete data of this type have been assembled in convenient form.

Copies of this chart will be sent, on request, to metallurgists, engineers, steel salesmen, purchasing agents and executives of the machinery and allied industries.

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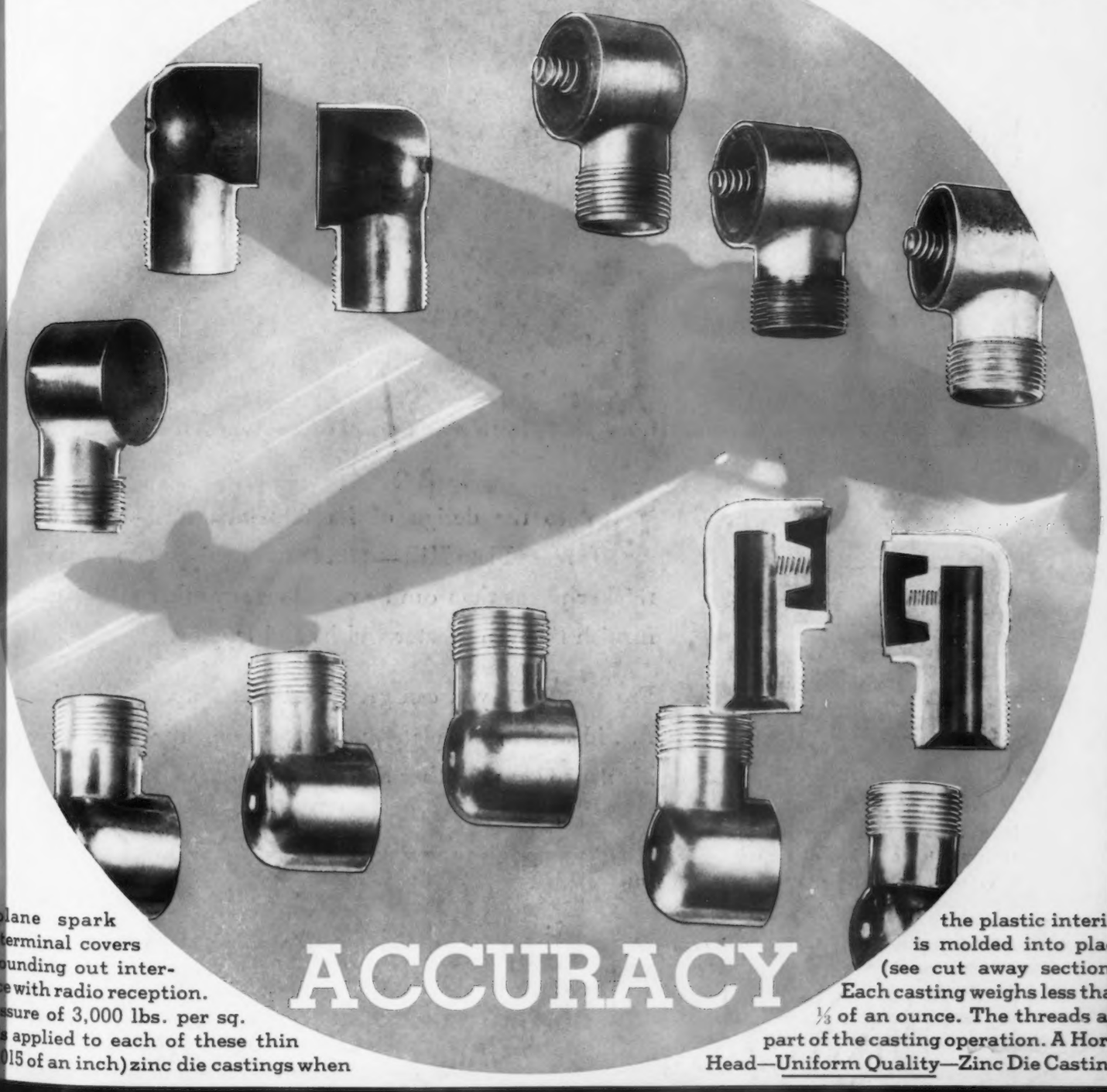

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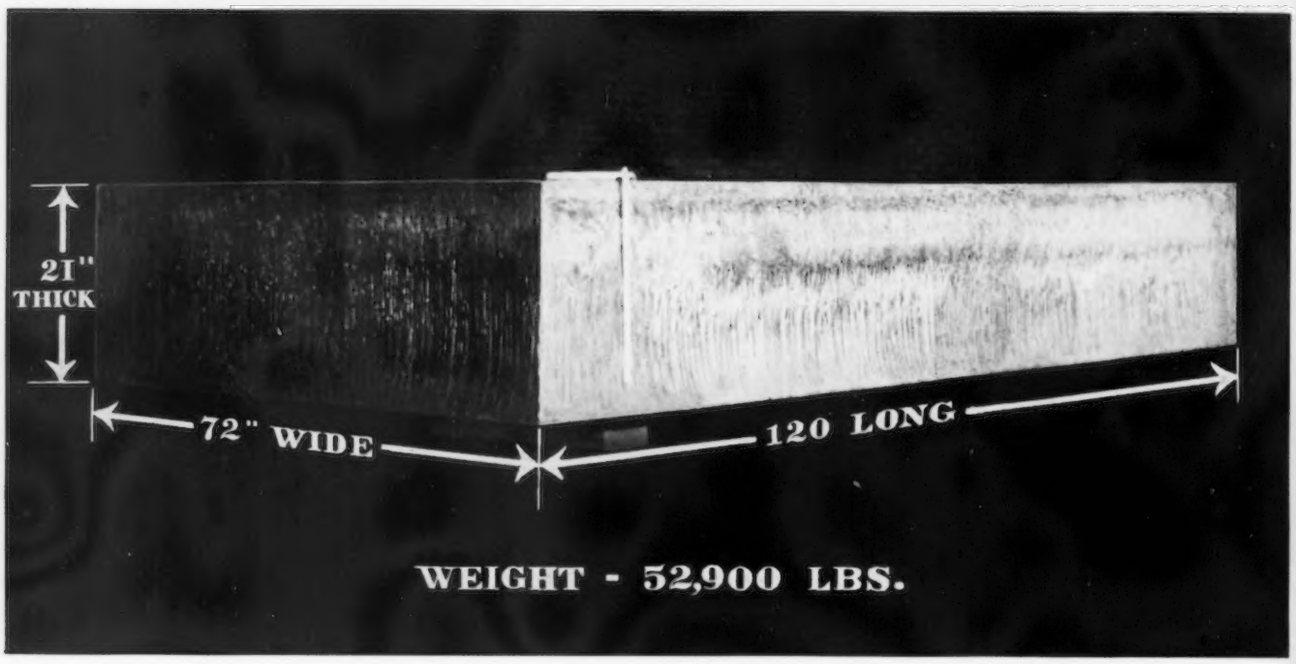

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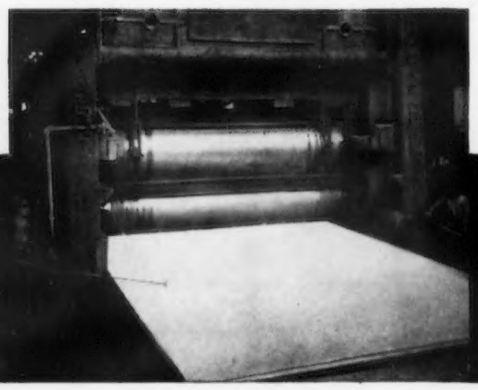

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